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Electrical World

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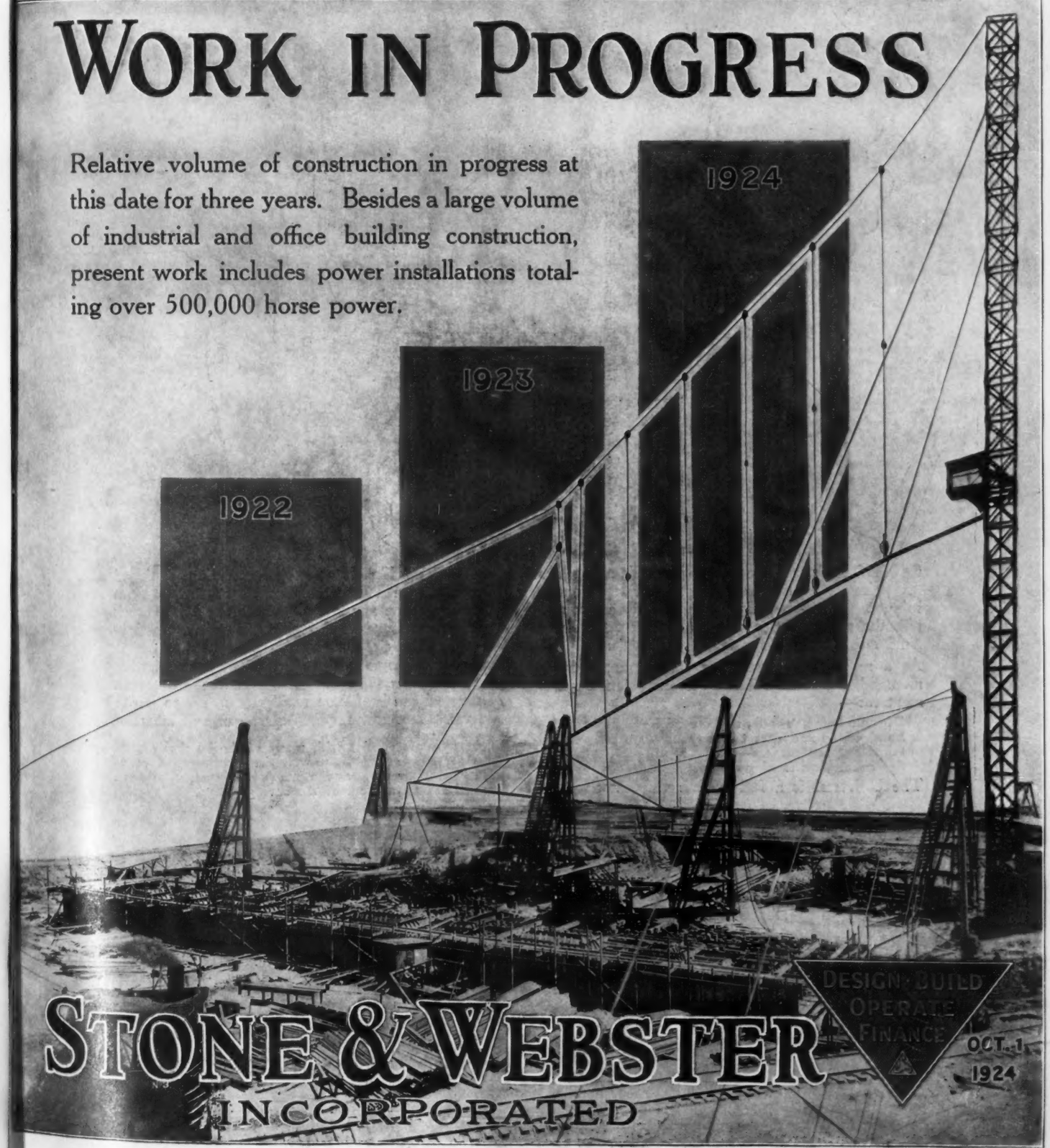

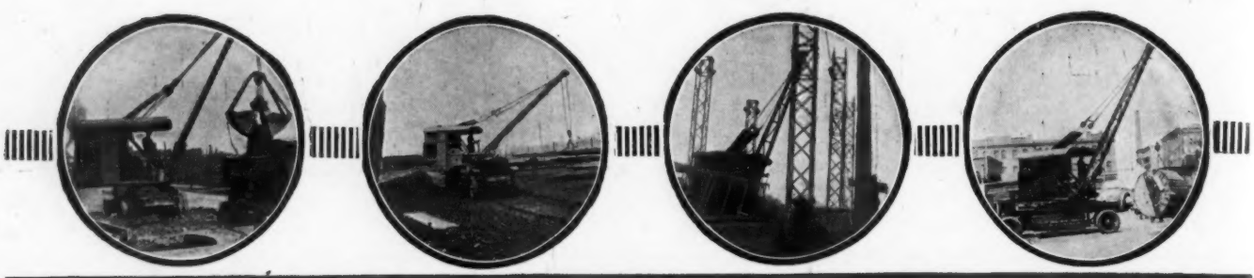

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W. H. ONKEN, JR. Editor

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Ford Withdraws Offer for Muscle Shoals

CONVINCED apparently that after having committed itself to a definite water-power policy there is no likelihood of the government tying itself up for one hundred years in any contract with him for Muscle Shoals, Henry Ford has turned his back on the Tennessee River and its spectacular possibilities. He has withdrawn his bid of $5,000,000 for a development which cost the government considerably more than $100,000,000, and he will generate all the electricity he needs for his purposes from steam.

Thus the way is now cleared for a quick settlement of the Muscle Shoals controversy. Early in 1922 Julius Kahn, chairman of the House military affairs committee, in an interview with the ELECTRICAL WORLD, proposed a Muscle Shoals commission empowered to adjust contracts then in existence and to enter into new ones. The commission was to be composed of executive and administrative officers of the War, Agriculture and Treasury Departments who would lease, sell or operate the plant at Muscle Shoals as they deemed best. Mr. Ford also suggests that a commission dispose of the matter, and in this he is to be commended. The drawn-out hearings before congressional committees on Muscle Shoals alone show how cumbersome and unsatisfactory present methods are and how hampered by political interference any proposed action is. The final disposition of Muscle Shoals is, of course, of immense significance to the Southeastern States. Mr. Ford has tried politics and knows its shortcomings. His experience should count for something, and his suggestion that a commission finally take the matter in hand deserves consideration.

Still Not Too Late to Organize Local Home-Lighting Contests

SOME seem to think that it is now too late to organize a local home-lighting essay contest under the Lighting Educational Committee's program in a community where for some reason the campaign has not got started. This is not so. True, all the material is ready; the national advertising is now appearing in the popular magazines; more than three thousand communities have already joined, and over eight million pieces of contest material—printed matter, badges and so forth—have been sent out by the Society for Electrical Development, which is doing the publishing and field work for the campaign. But there is still time. The national advertising will continue. Shipments of material are right up to date and orders can be filled at short notice. A November contest in any town can be as successful as an October one could have been.

Sufficient experience has been gained so far to enable the late starter to benefit by much that has been done. The extent to which the schools have accepted this contest as a constructive educational effort will aid greatly in presenting the opportunity to local educational authorities. It is only necessary to form the committee and organize the contest to start on November 1. The prime essential, of course, is a leader—the outstanding electrical man in each community, the man best suited for the job, be he central-station executive, manufacturer, jobber, contractor or dealer. In any event the support of the central-station companies is vital, and every company should set aside as much man power as possible to aid the work during these weeks, that this great lighting story may be told, and that through the co-operation of the children this great lesson in safeguarding eyesight may be carried to every home in the land.

Stronger Liaison Needed Between Group Conventions

AS TIME goes by it becomes more and more impressed upon any one who habitually attends the national conventions of the electrical industry that there is insufficient contact between these major associations. As a result men constantly get up in meetings and, through misunderstanding, misinterpret the policies or purposes or practices of some other group association, and because no representative of that other association is present to speak for it, bad impressions are made that erect fresh barriers in the way of harmonious co-operation in the industry.

The interests and activities of the electrical manufacturers, jobbers, contractor-dealers and central-station commercial men are so interrelated that it is almost impossible for any one of them to discuss commercial problems or policies without taking other groups into consideration. Distribution, market development, profit, margins, inspection standards and a dozen other matters of constant discussion concern them all, yet viewpoint is apt to differ materially between them. It is inevitable that irritating situations should arise from these divergent opinions and that one group should sometimes be led to accuse another of selfish and willful disregard of common interests. As a matter of fact, there is probably no basis for hurt feelings other than that some man has heard something and misunderstood and told the rest. But nobody is present to explain.

There are proper legal reasons, of course, why organized representatives of different branches of the industry should not combine to establish policies affecting credits, prices, distribution of goods and other measures that would lay a restraint upon trade. But there is no reason in common sense why the different groups of a great industry should not send men to attend, as welcome guests, the conventions of other groups, that each may understand the trend of thought within the other associations and be able to clear up

incidental misunderstandings that may arise in any meeting by a frank, free, open interpretation.

It would be a fine thing for the electrical industry if a prominent member of each of its groups were in attendance at the important national conventions of the others. He should be a man of sufficient knowledge, tact and personality to be able to speak informally and unofficially for his group and to take back a broad-visioned report of the proceedings.

Politicians Are Beginning to Look Before They Leap

MANY municipalities which have entered upon utility ownership and operation are learning that an expanding service demands a continual stream of investment funds. They are finding that the ownership of their own lighting, water or street-railway system results in the necessity of bond issue after bond issue to obtain funds to expand the service facilities. Even the politicians are learning that they play with fire when they attain office on a public ownership platform which is accompanied by an initial bond issue. For the public accept the succeeding bond issues with less and less favor, and the novelty of the public ownership idea is replaced with the actualities of monthly bills and yearly taxes. The taxpayers soon learn that the original investment is only a beginning and that other money must be obtained and invested as the years go by.

Los Angeles, for example, is finding it more and more difficult to get the people to vote bond issues for its municipal enterprises. The Hetch Hetchy project at San Francisco has consumed forty-five millions already and yet a new ten-million-dollar bond issue, just voted after a strenuous compaign, is only a small part of the total sum that will be required. In older municipal ventures the principal political activity is concerned with getting new bond issues accepted. Evidence accumulates that municipal enterprises requiring frequent increments of investment are meeting with trials and tribulations. In the world of affairs a day of reckoning always comes.

Loyalty Can't Be Bought, but It Can Be Bankrupted

IN ONE sentence W. J. Welsh at the Lake Placid meeting of the Empire State Gas and Electric Association put his finger on the crux of the utilities' public relations problem when he asked how companies expected to raise the element of personal service to the same standard as their technical service so long as the salaries paid by utilities are not comparable with the earnings of organized labor. This somewhat rhetorical question remained unanswered in open meeting, but it was significant and interesting to note afterward that Mr. Welsh was the recipient from other executives of numerous expressions of approbation for the sentiment he expressed. All agreed that the solution of the public relations problem lies in improving the element of personal service to customers.

Much as has been said concerning the disparity between the compensation and the duties not only of the utility engineers but of department heads as well, the one important consideration appears to have been sidetracked. Admittedly the responsibilities of the central-station business require men with a high degree of intelligence and integrity. Their work requires at all times that they exercise judgment, tact and executive ability over and above their purely technical knowledge or training. There is also a large degree of dignity attached to the utility business, and only through its personal representatives can a company maintain its standing in the community.

Although utility employees may continue to perform their work efficiently because their sense of loyalty is greater than their desire for monetary gain, this situation cannot always last. Indeed, the number of well-qualified men who have already left the central-station industry for more lucrative fields is not small. No company can expect to buy loyalty by offering high salaries, but any company can bankrupt loyalty by the continuance of a niggardly policy in the matter of compensation. The central-station companies ought to pay good salaries. In fact, if they are to be properly represented in the communities they serve, they cannot afford to do anything else.

The Motor-Generator Locomotive— A Significant Electrification Development

THE purchase of alternating-current motor-generator locomotives by the New York, New Haven & Hartford Railroad is bound to excite interest in both railway and power circles. This locomotive will have many features of special engineering interest. From the purely transportation side it presages the development of a universality of type of locomotive with consequent interchangeability between railroads, and from the power angle it holds promise of an eventual simplification of power supply to electrified railroads, as well as a more active period of electrification.

The motor-generator locomotive was suggested many years ago, and there has always been recognition of the many advantages of a machine that would draw its energy from an alternating-current trolley and operate with direct-current motors. But the extra rotating converting equipment has seemed an apparently unnecessary complication, and at the time it was first proposed the weight placed it out of the question compared with other types. Recently, however, since the development of the 3,000-volt direct-current locomotive engineers have discovered that the motor-generator locomotive would weigh no more than the corresponding 3,000-volt direct-current unit. This is due to the elimination of the heavy and extensive control equipment for 3,000-volt operation, and also to the heavier motor for 1,500 volts as compared with the lower-voltage motor. Furthermore, the simplicity of operation by control of generator voltage is an attractive feature. Thus, Henry Ford about a year ago ordered locomotives of this general type for the electrification of his Detroit, Toledo & Ironton Railroad.

The famous "battle of the systems" was perhaps a necessary phase of electrification development. But in the past two or three years the advantages of electrification, independent of system, have been brought forcibly to the front. This, of course, is the only way that railroad managements can ever be won to a program of electrification. That both the major companies are aggressively on the alert to electrify, independent of system, is a good omen for future development. It may be that a single common type of locomotive will actually be evolved. It has been predicted recently that the answer to the question of type would be found in this alternating-current-direct-current locomotive. And it is doubtless in the minds of many that future de-

velopment may see the motor generator replaced by a simpler, lighter device—possibly a mercury-arc rectifier, possibly a large thermionic or "vacuum" tube.

From the transportation standpoint solely, there are several advantages which would result from a universal adoption of locomotives which will take power from the same overhead system. Interchangeability of locomotive equipment is a primary advantage, because it immediately makes it possible to finance that equipment by equipment-trust mortgages, the locomotive having a second-hand value it does not now possess.

From the power viewpoint, the alternating-current-direct-current locomotive promises to make possible a more simple supply of power to electrified railroads. While present equipment is from 25-cycle trolley direct-current through a 25-cycle motor to the generator and motor, it is not a large step to a 60-cycle trolley and motor. This in turn means that railroad overhead may then be supplied from the growing 60-cycle superpower network without interpolation of rotating apparatus.

Superpower Lines Adjacent to Railroads

THE location of railroads should to a large extent afford a guide to the location of superpower transmission lines. Through a process of development the railroads now traverse the country along routes where electric power is needed in greatest amount. The major industries, cities and developments are always located on railroad lines, and careful consideration of this fact in the location of superpower transmission lines offers attractive possibilities to the electrical industry.

Other considerations tending to support this idea are the ultimate electrification of the railroads, the possibilities of readily interchanging "wash" power from company to company, the location of the heaviest loads near the trunk lines, the most accessible right-of-way and certain possible operating and investment economies obtainable because of the proximitv of railroad, transmission, signal and communication circuits. These facts are of indisputable importance in the development of electrical transmission systems.

A Little Matter of a Word

THERE are some poor words in the central-station selling vocabulary, come there largely by accident because they are convenient for use within the organization, but without any particular regard to what they may mean to the public. The word "demonstration" is an example—a good enough term within the office, but a bad one outside. It bears a taint today to the mind of the average housewife because of the food demonstrator and the house-to-house peddlers of soap, mops and metal polish who hold forth at food shows and county fairs or argue with a foot in the front door.

More than one progressive central-station sales department has made this word taboo on this account and substituted the term "instruction," which is acceptable to any one and actually more truly descriptive of the function of the growing army of young men and women who are teaching the American public how to "do it electrically." It is a little thing, but of such small things are good public relations built on a foundation of common understanding.

The Kind of Research Left to Colleges

THE organization in Schenectady and East Pittsburgh of large laboratories for research, as well as the work done by the Bureau of Statistics, Nela Laboratories and Electrical Testing Laboratories, has considerably modified, although not necessarily narrowed, the scope of research left to be done in colleges. Some prominent educators believe that in so far as research by students is concerned, both undergraduate and graduate, its main purpose is not to obtain new and useful results, but to train young men and women in research methods—just as soldiers are trained to bayonet straw bags for experience. From this point of view the rapid growth of industrial laboratories should stimulate research by students in colleges, in view of the new opportunities offered in this line as a life career.

There remains, however, the problem of research by the members of the instructing staff, and the desirability of much higher output in this respect has been pointed out more than once on these pages. A professor can hardly be expected to punch straw bags just to fill his time. Every issue of technical magazines brings him news of noteworthy achievements by industrial laboratories, mostly co-operative achievements for which he has no facilities. So he is apt to lose his interest in original research, and then it is only a question of time before he loses interest in advanced studies and in the progress of the art, busying himself with schedules, mimeographed instructions, committee meetings, etc. All these "trimmings" are probably a necessary element in a professor's life, but they are good chiefly as trimmings to something more fundamental, namely, an enthusiasm in the science and art of engineering, which can only be kept up indefinitely by those who take an active part in it.

A solution of this difficulty, and one well followed out by our European confrères, is that of specializing in colleges on general methods of attack, especially on methods requiring advanced theory or delicate apparatus. Actual experience shows that the most valuable aid so far given by our American professors to the electrical industry, aside from training young men, has been an early elaboration of theoretical and experimental methods several years ahead of their practical need. On the other hand, attempts at participation by professors in the actual solution of specific problems have not been nearly so fruitful.

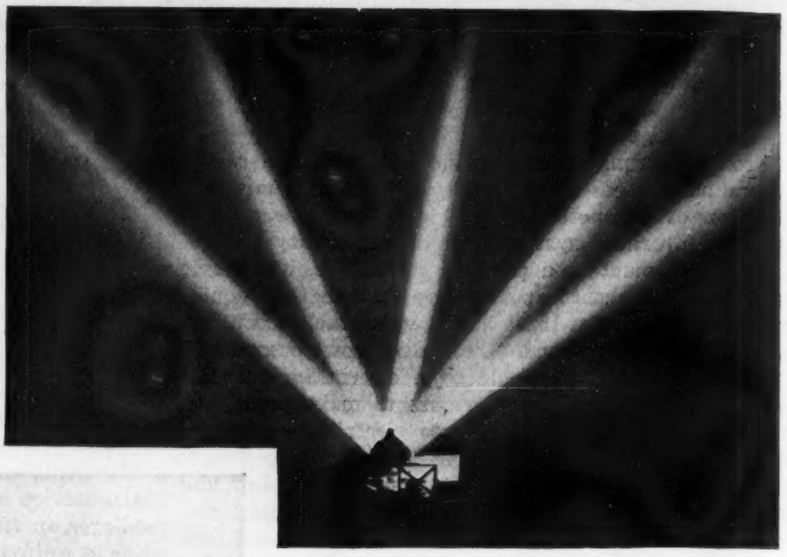
However great the resources of an industrial laboratory may be, its members are usually handicapped by the fact that specific problems come to them to be solved within a short time, and often there is no time to develop a general rational method of attack. Then the problem is dropped for something more urgent, and a notation is made to follow the subject later, "when we are not so busy." Here it is where our industrial laboratories could guide and inspire professors by communicating to them these suggestions for research. Too much unnecessary caution has been exercised in this respect in the past, to the detriment of the industry itself. Nothing is more urgently needed than better and simpler experimental and mathematical methods of solution of our outstanding industrial problems, and to exchange a little trade secret now and then for a new method which will save more money in the end is well worth the price.

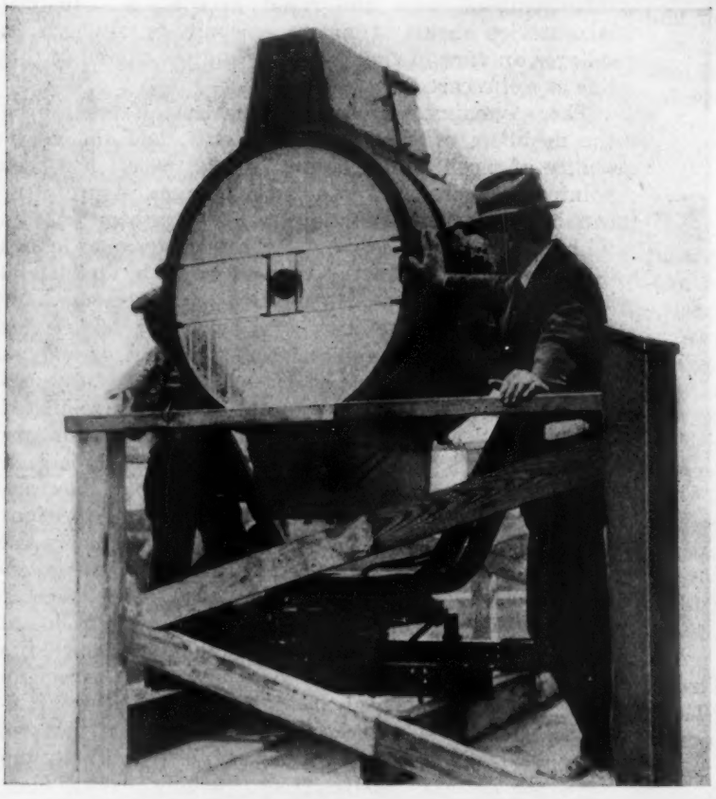
Lighting Air-Mail Route

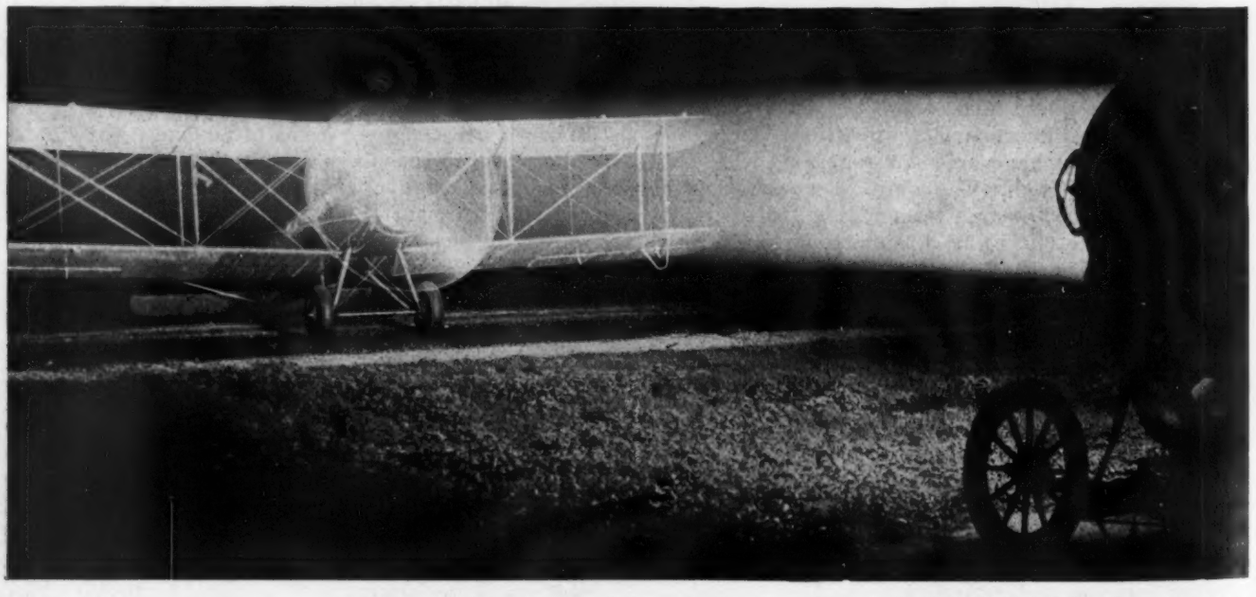
TO CARRY on the thirty-four-hour mail service by way of air between New York and the Pacific Coast which was inaugurated July 1 by the United States government it is necessary that airplanes fly during the night as well as by day. To guide the planes during the night a visible and clearly defined route must be provided across the country. In addition, the landing fields, fifteen in all, must be adequately illuminated.

The lighting plan of the Maywood (Ill.) air mail field was designed and installed by Robert J. Malcolmson, lighting engineer of the Public Service Company of Northern Illinois, in co-operation with I. D. Marshall, assistant to the electrical engineer of the central division of the Air Mail Service.

Three projectors safely guide the approaching flyer's landing. One 36-in. projector is mounted on the hangar roof. It revolves three times a minute, so that the approaching pilot will catch the flash from a beam of 500,000,000 cp. every twenty seconds. The second 36-in. projector is mounted on a portable carriage for illuminating the runways. An 18-in. projector is used as an auxiliary beacon.







Common Return for Street Lighting

Advantages and Disadvantages of the System—Field Experience and Methods for Testing and Maintenance—Use of Common-Neutral Network System

By H. RICHTER
New York, N. Y.

THERE are many distribution systems that still operate series street-lighting circuits as individual two-wire circuits, running both legs out of the station as trunk lines to the first and last lamps. This method is analogous to that of the original light and power distribution system which consisted of a multiplicity of two-wire direct-current or single-phase alternating-current circuits radiating from the station even to the most distant points.

As a means of eliminating some of the return legs, and yet operating on an all-wire circuit, in order not to introduce telephone interference, the common return system has been tried out during the past nine months in New Orleans. Two of these systems, each comprising seven circuits, are now in operation. As a result of this trial the direct-current arc circuits feeding the portion of the city to be served by the new Polymnia substation are being rearranged to form three groups or common arc return systems.

Having chosen the wire to be used for the common return, each negative trunk is dead-ended at the pole where it meets the common return wire and is tied to the common return through a single-pole, single-throw switch (such as switch 1, etc.), mounted adjacent to the negative trunk. At the station the negative outgoing leads are connected to the outgoing common negative return wire by means of a common negative bus. The negative leg of each of the commoned circuits is grounded at the station by a lead connected at any convenient point between the constant-current transformer and the control panel. This completes the modifications in the two-wire circuits.

Switches (switch 1, etc.) are installed to permit isolating each circuit from the common return for testing and repairs. The permanent grounds at the station constitute a safety feature such that, under normal operation with all switches closed, if any circuit is opened on the high side either in the station or on the line, that circuit will be safe to work on while the other circuits of the common system are still in operation and their return currents traveling back over the common return. The common negative bus shown in Fig. 1 was not chosen for connection to the permanent ground because in that case every test at the station for grounds on the outside system would show a ground. Instead, to each of the station circuits a ground was given, and this also insures that whenever the common return wire is in use it is grounded. The particular scheme of connection of these grounds shown in Fig. 1 was the quickest one to install for the test, but a second common negative bus on the machine side of the secondary plug switches would make a better arrangement.

The maximum number of circuits that can be coupled together to form a common return system is limited by the current-carrying capacity of the common negative return wire and the common negative bus, the voltage drop in the common return wire with a maximum number of lamps on each circuit, the number of circuits that it is considered advisable to make dependent on the single negative return wire, and grouping of circuits by areas defined by definite geographical boundaries. In New Orleans, where 5.5 amp. is normal current for the street-lighting circuits and where all street-lighting lines are No. 6 A. W. G., the maximum number of circuits allowable in one common system is nine, as limited by the current-carrying capacity of the length of rubber-covered cable running underground from station to terminal pole near by.

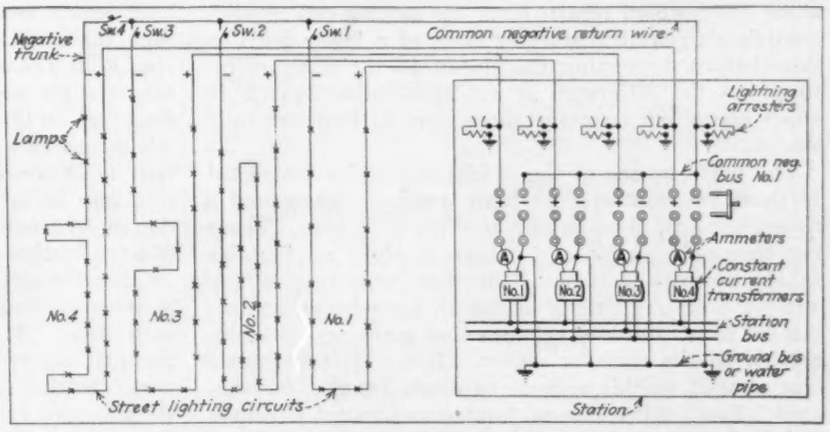


FIG. 1—LAYOUT OF SUBSTATION EQUIPMENT AND OUTSIDE LINES FOR A TYPICAL COMMON RETURN CONSTANT-CURRENT SYSTEM (SWITCHES 1, 2, 3 AND 4 ARE CLOSED NORMALLY)

The choice of circuits to be coupled together in a common return system should be governed by the greatest economy of overhead copper obtainable. Hence it is preferable to choose circuits that are adjacent to each other and whose negative trunks return to the station along the same general route. In practice, the wire chosen for the common return of the group is usually the negative trunk of the circuit most distant from the station. This is in order to avoid making splices in the common return wire. It is advisable to use a size of wire for this common return not smaller than No. 6 A. W. G. for reasons of mechanical strength, since every reasonable precaution should be taken to prevent trouble on this line. Similarly, the condition of insulators, pins, etc., on this common return should be as good as possible, for an open circuit on this line

involves every one of the circuits that is coupled to it.

The points at which the negative trunks of the various tied-in circuits, such as circuits Nos. 1, 2 and 3, meet the common negative return and dead-end are generally junction or corner poles, where climbing is impeded by buck-arms, street lamps, etc. Therefore it is preferable to mount switches 1, 2, etc., at the first convenient pole adjacent to the dead-end, bearing in mind accessibility for testing purposes. The switch should be single-pole, single-throw and about 100 amp. rating for purely mechanical reasons. It should be mounted in a wooden or composition box and attached to the cross-arm adjacent to the negative trunk. A primary cut-out in a box may also be used for this purpose, a piece of copper wire being substituted for the fuse.

The common negative bus for each common return system may be a length of wire of the same size as the common negative return wire, strung along the rear of the control panel switchboard and mounted on plain low-voltage insulators or cleats.

In New Orleans the individual circuits of the two common return systems under test are being operated in exactly the same manner as before commoning; the only change in routine is in the method of testing and "shooting" trouble. Owing to increased voltage drop along the common return wire, the moving coil of each constant-current transformer rides at a lower position than before connecting the circuit to the common return, but the difference is not appreciable enough to affect operation, even for those circuits that are fully loaded.

The performance of the overhead circuits connected to these two systems has been watched closely and a record of all troubles encountered has been kept. There has been only one case of outage at night attributable to the common system. This was caused by a guy wire of a derrick falling across an arc wire and shorting out all of the line between that point and the connection to the common return. However, the trouble was cleared quickly enough to avoid penalty for outages. Every other case of trouble was traced to causes that had no connection with the fact that the circuits were commoned up. To date there has been practically no difference between the performance of these circuits as part of common return systems and their action before the beginning of the trial.

Experience with Alternating-Current System

A number of alternating-current series circuits feeding incandescent lamps that were connected to form a common return system have been under observation for three months; from their performance the conclusion can be drawn that this system can be applied to alternating-current overhead circuits and the same results expected as for direct current. For circuits involving underground cable and series transformers buried in the ground or in concrete the latter equipment should be put in good condition before the circuits are connected to a common return. Otherwise the instances of single grounding that are so numerous on run-down circuits will result in an increase in trouble calls instead of a decrease, since one ground on a circuit will cause outage of all lamps between the grounded point and the common return wire. Underground circuits in good condition should give as satisfactory operation as that recorded above for the overhead circuits.

Tests at the station for open circuits on the lines are made exactly as in the case of individual two-wire circuits. In the case of a ground or high-tension cross on any of the commoned circuits the trouble will show up when testing any one of these circuits at the station. A scheme of reporting trouble similar to that of Fig. 2 is advantageous for co-operation between station operator and troubleman and also helps each to picture the nature of the trouble.

As an example of the usual method of "shooting" trouble, suppose an open circuit is reported on circuit No. 2 (Fig. 1). The troubleman goes to switch 2, opens it, telephones the switchboard operator to ground the positive leg of circuit No. 2 at the station and tests this circuit with a magneto to check the report of open circuit. If the operator's report is correct, the troubleman leaves switch 2 open and proceeds to the nearest half or quarter test point of circuit No. 2, opens the circuit at the lamp and tests with the magneto against the ground on the positive leg at the station. He then locates the open by the usual cut-and-try method. After repairing the trouble he returns to close switch 2 and calls for a test from the station.

Locating a Ground on Lighting Circuit

If a ground on a common return system is reported the troubleman goes to the nearest switch on that system, which might be switch 1 in Fig. 1, makes sure that the switchboard operator has disconnected this circuit at the station, opens switch 1 and tests with magneto for a ground on circuit No. 1. If no ground shows up on this circuit, the troubleman closes switch 1, telephones operator to restore circuit No. 1, goes to next most convenient switch and repeats the test. In this way he tries each circuit on that system till the circuit in trouble is located. He then applies the cut-and-try method with magneto to isolating the ground on this circuit, starting by opening the circuit at the most convenient half or quarter test point and testing both ways. If none of the individual circuits show ground, the trouble must be on the common return wire. In that case all the commoned circuits are killed, all the test switches, etc., opened, and the common return wire tested by the cut-and-try method, opening the line by cutting jumpers at convenient turning points. As noted in the last paragraph, all test switches must be closed after the trouble is cleared.

A high-tension cross on a common return system is located by a method of isolation similar to that described above for a ground.

The following advantages and disadvantages of the common negative return system have been proved during the trial period of operation in New Orleans:

1. Saving in copper, pins, insulators and cross-arm space, proportional to the length of return trunk.

2. Where series circuits are led out of the station underground to terminal poles erected some distance away from the station, the economy is multiplied by the use of fewer underground cables, potheads or switches, outdoor and indoor lightning arresters and stand-pipes, as well as by conservation of duct space.

3. The elimination of the above equipment from the distribution system is reflected directly in a saving in operation and maintenance costs.

4. Where a number of alternating-current circuits are coupled together into a common return system and the constant-current transformer primaries are connected alternately to the A, B and C phases of a three-phase bus, it is often possible so to choose the circuits

that are connected to the common return that only a negligible current will flow back to the station over this wire, the 120-deg. out-of-phase currents balancing each other out over the common return in a manner similar to that in the neutral of a three-phase, four-wire distribution feeder.

5. Testing for open circuit is simplified by the necessity of grounding only one leg of the circuit, the positive, at the station.

6. Testing for grounds and crosses is complicated by the requirement of making a test at each test switch in place of knowing definitely from the station test which circuit is in trouble. If the most convenient circuits are tested first, in order, the actual time to travel to

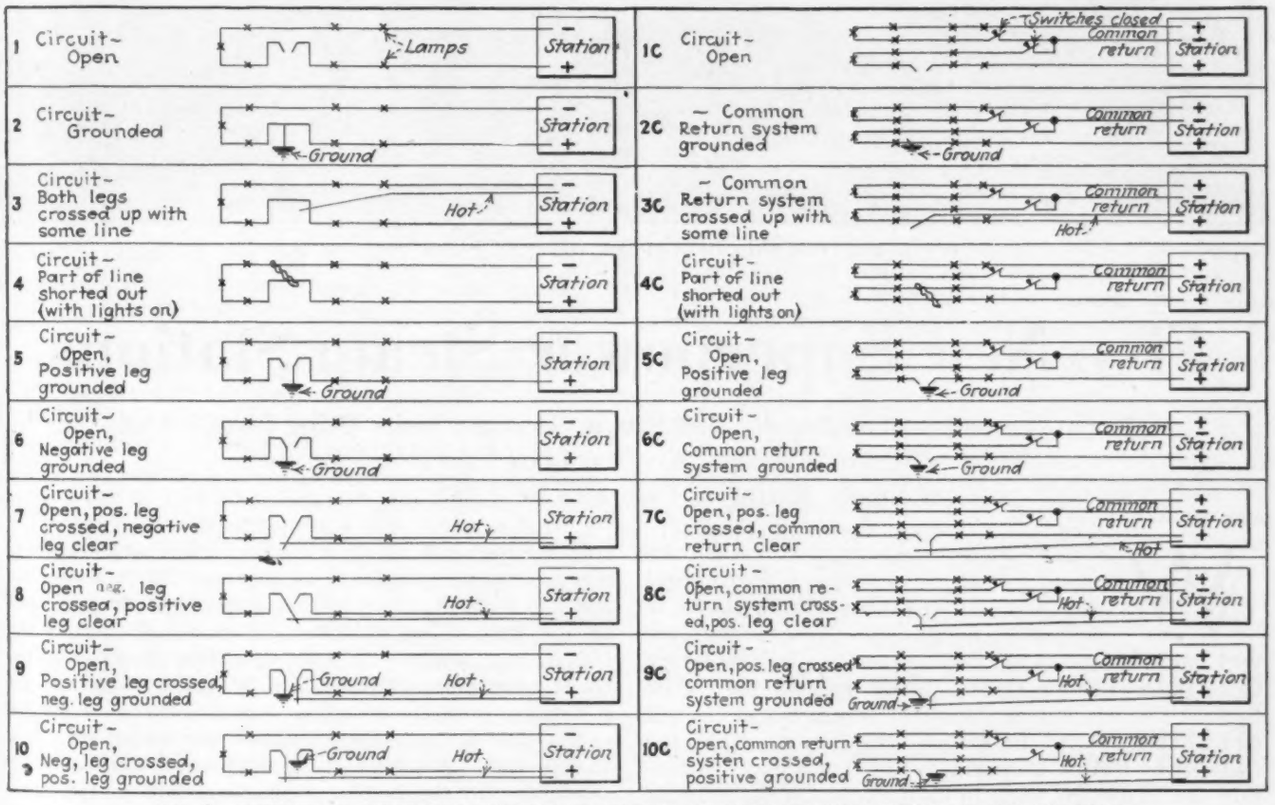

1 Circuit-Open
Lamps
Station
2 Circuit-Grounded
Ground
3 Circuit-Both legs crossed up with some line
Hot
4 Circuit-Part of line shorted out (with lights on)
5 Circuit-Open, Positive leg grounded
6 Circuit-Open, Negative leg grounded
7 Circuit-Open, pos. leg crossed, negative leg clear
8 Circuit-Open neg. leg crossed, positive leg clear
9 Circuit-Open, Positive leg crossed, neg. leg grounded
10 Circuit-Open, Neg. leg crossed, pos. leg grounded
1C Circuit-Open
Switches closed
Common return
2C Common Return system grounded
3C Common Return system crossed up with some line
4C Circuit-Part of line shorted out (with lights on)
5C Circuit-Open, Positive leg grounded
6C Circuit-Open, Common return system grounded
7C Circuit-Open, pos. leg crossed, common return clear
8C Circuit-Open, common return system crossed, pos. leg clear
9C Circuit-Open, pos. leg crossed common return system grounded
10C Circuit-Open, common return systen crossed, positive grounded

FIG. 2—SCHEME OF REPORTING TROUBLE ON STREET-LIGHTING CIRCUITS USING COMMON RETURN

the fault will be about the same as under the old system. The only extra time consumed is that of making the test at each switch. This time is usually only a fraction of the total time required to locate the trouble. Furthermore, it is not of great magnitude in the aggregate since only about 20 to 25 per cent of the total number of troubles that require testing is due to grounds and crosses.

In view of the employment of a thoroughly grounded common-neutral network for the 4,000-volt Y primaries and 115/230-volt secondaries, in the reconstruction of the light and power distribution system of New Orleans, it is considered possible to eliminate even the common return wire of each common return system by utilizing the common-neutral network as the return of all street-lighting circuits to the station. Thus, in Fig. 1, instead of connecting the negative trunk of each arc circuit through switches (switch 1, etc.) to the common negative return, the connection would be made to the nearest common-neutral wire; in place of connecting common negative bus No. 1 at the station to an outgoing common return wire, this bus would be connected to the common-neutral bus, and the ground connections to the individual constant-current transformers would be eliminated.

The advantages and disadvantages anticipated for such a common neutral return system are as follows:

A. Further saving in the various items enumerated in advantages Nos. 1, 2 and 3 previously listed, in accordance with the number of common return wires eliminated.

B. Removal of dependence on a common return wire for continuity of service of all street-lighting circuits connected to that wire.

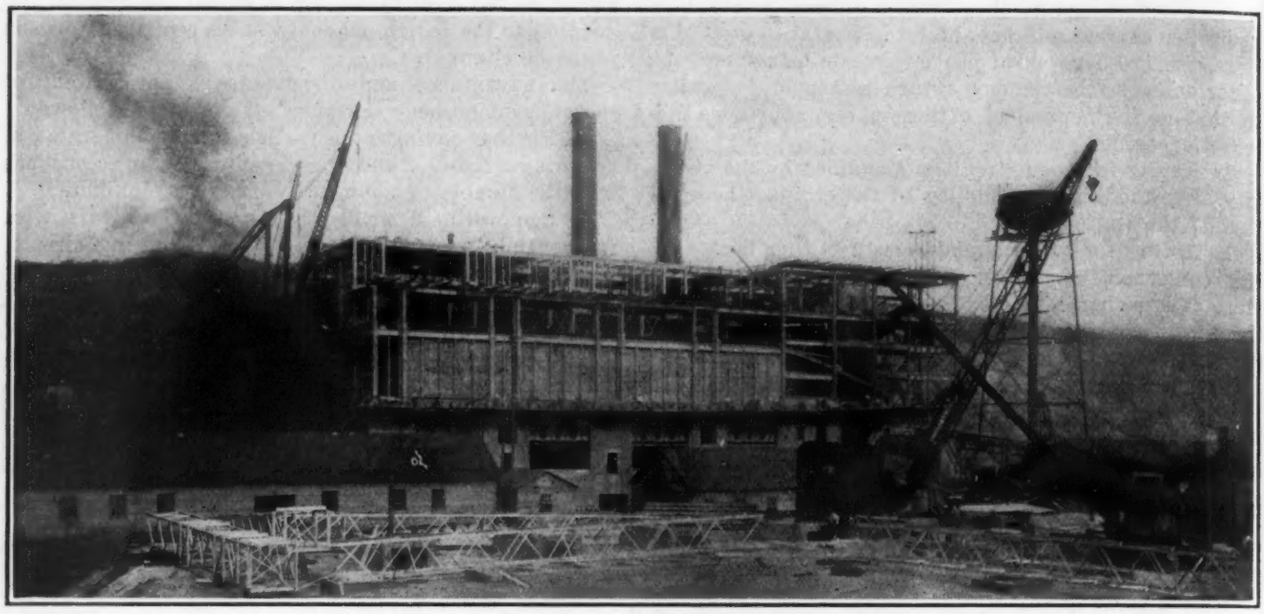
C. Higher electrical efficiency by substituting the greater conductivity of the common-neutral network for that of the single return wire. In New Orleans the comparison is between a single No. 6 A. W. G. wire and a network consisting of No. 2 A. W. G., No. 1/0 and No. 4/0 lines.

D. Greater flexibility in the operation of the individual constant-current transformers connected to the common-neutral network, due to the reduced voltage drop over the return path resulting in the moving coils of these transformers riding at even higher positions than under the original two-wire circuit operation.

E. It will be possible to have practically every street-lighting circuit take advantage of the common return.

F. A certain amount of overhead wire is saved because of the fact that some common-neutral wire is usually much nearer the last lamp on each street-lighting circuit than is the common return wire running back to the station over the shortest or most advantageous route.

G. Using the common-neutral network eliminates the advantage of testing from the station for grounds and crosses on the common return system prior to sending a troubleman out. Tests for opens on the individual circuits can still be made from the station.



TORONTO PLANT OF THE OHIO RIVER EDISON COMPANY TO USE PULVERIZED FUEL

Five New Superpower Steam Stations

Turbo-Generators Totaling 465,080 Kw. in Thirteen Units Being Installed at Toronto (Ohio), Chicago, Kearny, Long Beach and Peoria— Ultimate Rating of Plants to Be 1,392,000 Kw.

WITHIN a few months five great new steam generating stations widely spread over the United States will be placed in operation, augmenting systems that are very much in need of the added capacity. In New Jersey there is the Kearny station, being built by the Public Service Electric Power Company, where five units will add 205,100 kva. to the system. At Toronto, Ohio, the Ohio River Edison Company is building a plant to contain two 33,000-kw. units in its initial stage, the ultimate plant to contain eight of these units. The Crawford Avenue station of the Commonwealth Edison Company, Chicago, will, by the first of the year, have three units totaling 160,000 kw. operating, the ultimate development here to be 600,000 kw. The Illinois Electric Power Company expects to have the first 20,000-kw. unit of its 40,000-kw. plant at Peoria operating by Dec. 1. This plant will ultimately have five of these units. At Long Beach, Cal., the Southern California Edison Company expects to have the first 35,000-kw. unit operating during November to meet the very serious shortage of power due to the continued drought.

Toronto Plant of the Ohio River Power Company

A station having several very interesting features is being constructed at Toronto, on the Ohio River, by the Ohio River Edison Company. Two 33,000-kw. units are at present being installed and will be operating by the first of the year. The ultimate development calls for eight of these units, or a total of 264,000 kw.

The power-plant building containing the boiler room, turbine room and electrical galleries is 185 ft. long and 155 ft. wide and has a reinforced-concrete foundation, steel frame and brick walls and reinforced-concrete floors. The boiler room is 90 ft. wide, 189 ft. 6 in. long and 110 ft. high. The turbine room is 65 ft. wide and 185 ft. long. The electrical galleries are 32 ft. wide, 185 ft. long and 80 ft. high with four floors. In the boiler room there are four B. & W. boilers, each having a heating surface including water screens of 22,500 sq.ft. The furnace volume above the water screen is 13,800 cu.ft. A superheating surface of 4,100 sq.ft. is available. In the turbine room there will be two General Electric Company turbo-generators rated at 33,000 kw. Each turbine has eighteen stages and is served by a 50,000-sq.ft. horizontal, two-pass Worthington condenser. Two 1,500-kw. house turbines are to be used.

The boiler steam pressure is to be 375 lb. with 265 deg. F. superheat, giving a total steam temperature at normal full load of 707 deg. F. Pulverized coal is to be used in this plant.

The variation of river level at this station between maximum flood and dead low water is 46 ft. Existing plants designed for such large water variations have hitherto employed the "condenser-pit" type of construction. In this plant hard pan was found at a convenient point for a continuous mat without the use of piles. The substructure was designed as a reinforced-concrete box resting directly on firm bottom and extending from the mat to the turbine level (which is also the yard level), 2 ft. above maximum flood. The advantage of this construction is that the turbines are set without long exhaust connections to the condenser, full barometric head is not exceeded at dead low water, and the whole plant has a common basement level. Inasmuch as the basement is the most important operating floor, the elimination of the condenser pit is a very decided

advantage. The superstructure has, by the above construction, been reduced about 36 ft. in height. The whole cost does not exceed that of the pit type of construction.

Individual intakes and screens are provided for each of the two circulating pumps for each condenser. The discharge tunnel is common to all units, but is arranged with bypass outlets between each pair of main units, for ice removal and sectionalizing for repairs. The whole substructure is largely a cellular construction for stiffening the bottom and side walls, and the cells are utilized for ash sumps, oil rooms, filter plant and similar service, making a further convenience of the design.

The boilers are provided with 10 per cent screens on three sides and the bottom of the furnace. In addition, air cooling of the side walls and front wall is employed, giving the whole furnace exceptional refractory protection. A special tile construction to lower the number of joints and consequent air leakage is employed, and this also embodies provision for expansion in short sections. Air preheaters are installed which will counteract any tendency to overcooling of the furnace at light loads. Individual forced-draft fans are installed at the top of the boiler house, blowing direct through the preheaters and into the boilers. The induced-draft fans are also placed at the top of the house, directly under the stacks, drawing from the preheater and discharging through a long diffuser up the stack. This arrangement gives the minimum of duct work and dampers and reduces the power requirements.

Complete automatic control of the boilers and furnaces is provided, in conjunction with a central control room for all mechanical functions, similar to that which has been so successful at the Lowellville station of the Pennsylvania-Ohio Power & Light Company.

The forced-draft fans provide an ideal means for mechanical ventilation of the plant. With the exception of a few windows in the offices and machine shop, there are only three lines of openings provided, all other windows being fixed. One line is in the boiler-room wall, one in the roof of the switch bay, providing intake air for boiler and turbine rooms respectively, and the third line, for excess air to the fans, is at the top of the boiler room near the fans. These windows are all under control of one man, and the scheme provides definite ventilation of the whole plant, undisturbed by changes of boiler feed, and recovery of all stray heat except that radiated from the outside walls.

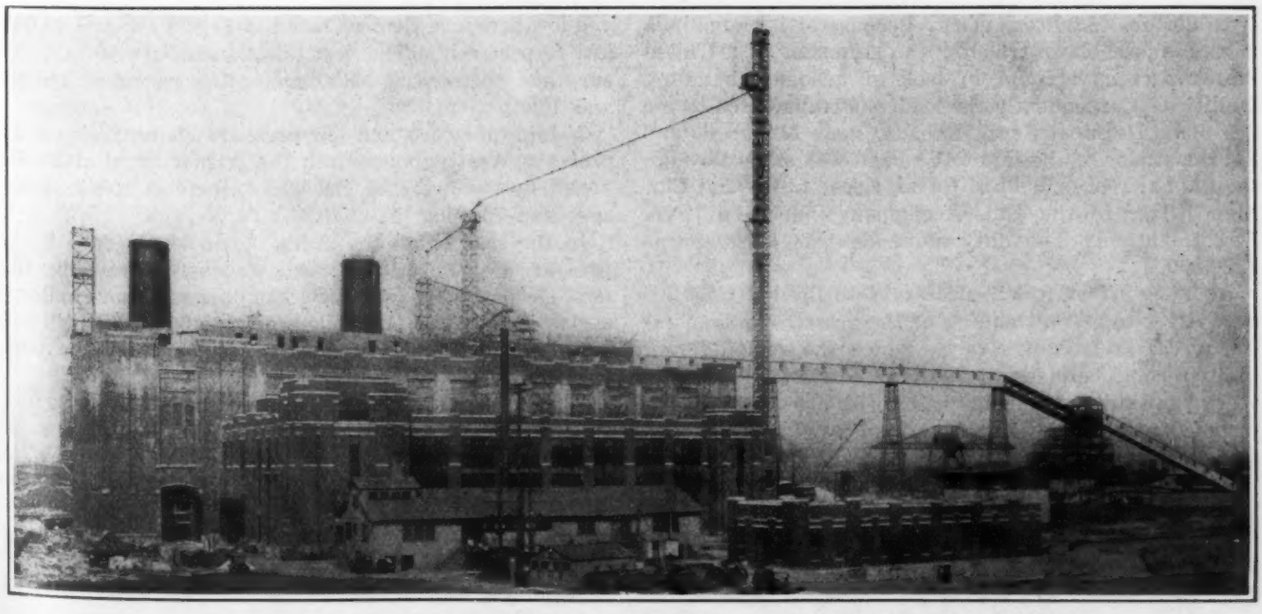
The heat-balance system consists of a house turbine with each main unit providing power for all major auxiliaries, bled at constant pressure at 196 lb. absolute and 52 lb. absolute, and exhausting at 18 lb. absolute. By interlacing these bleed points with two points on the main unit, together with a third point for the evaporators, the following features are obtained: (a) Constant-feed temperature (378 deg. F.) at all loads; (b) bleed-controlled house turbine yielding just the power required for major auxiliaries at all loads; (c) house-turbine Rankine efficiency practically equal to that of the main unit; (d) complete independence of auxiliary service from outside or main unit disturbances, and (e) no hand adjustment for heat balance at any load, the balance being automatic.

The coal supply is by a 400-ton counterbalanced-bucket fixed tower on the river wall direct by belt conveyor to a crusher tower serving either the bunkers or the storage. A second source is from a stripping mine at the opposite end of the reversible storage conveyor belt. Storage is by Lidgerwood movable-tower cableway. The towers are on beams surrounding the storage area so that underwater storage can be provided without further cost.

There are no main generator buses. All interconnection is performed on the high-tension side at the step-up station exterior to the main building. The auxiliary service is supplied from a bus, and the only connecting link between main lines and auxiliary buses is by the house transformers, through limiting reactors. These house transformers perform the double service of taking up any slack from the house turbines and acting as spares for them. Stevens & Wood, Inc., of New York are the engineers constructing this plant.

Crawford Avenue Station in Chicago

The arrival in Chicago on Monday, September 29, of the 50,000-kw. turbo-generator made by C. A. Parsons & Company, Newcastle-on-Tyne, England, brought near to completion the first section of the Commonwealth



COMMONWEALTH EDISON COMPANY'S NEW CRAWFORD AVENUE PLANT, RATED AT 160,000 KW.

Edison Company's new Crawford Avenue station, which will have an initial rating of 160,000 kw. At present the plans are that the station shall have an ultimate rating of 600,000 kw., although it is more than possible that this may be exceeded. The station is well along in construction. Two other turbo-generators have already been received and are being rapidly assembled. One is a Westinghouse unit rated at 50,000 kw., the other a General Electric unit rated at 60,000 kw.

The receipt of the English turbo-generator aroused great interest, not only because it is the largest unit ever constructed outside the United States, but also because it was transported in bond via all-water route from England to Chicago. It was brought to America on the SS. *Cairntorr* in 187 pieces, two of which weighed 76 and 67 gross tons respectively. One of these pieces measured 19 ft. 11 in. x 12 ft. 6 in. x 18 ft. 4 in. over all. Thirteen other pieces ranged in weight from 20 tons to 50 tons each. Because of its huge bulk it was impossible to transfer the shipment at a United States port on account of lack of adequate handling facilities. Consequently the load was transferred to the SS. *John Gehm* at Sorel, Canada, near Montreal, and the remainder of the trip to Chicago was made through the St. Lawrence, Welland Canal, Great Lakes and Chicago River, to the Edison company's docks at Fisk Street station. The duty alone on this turbine was $220,000.

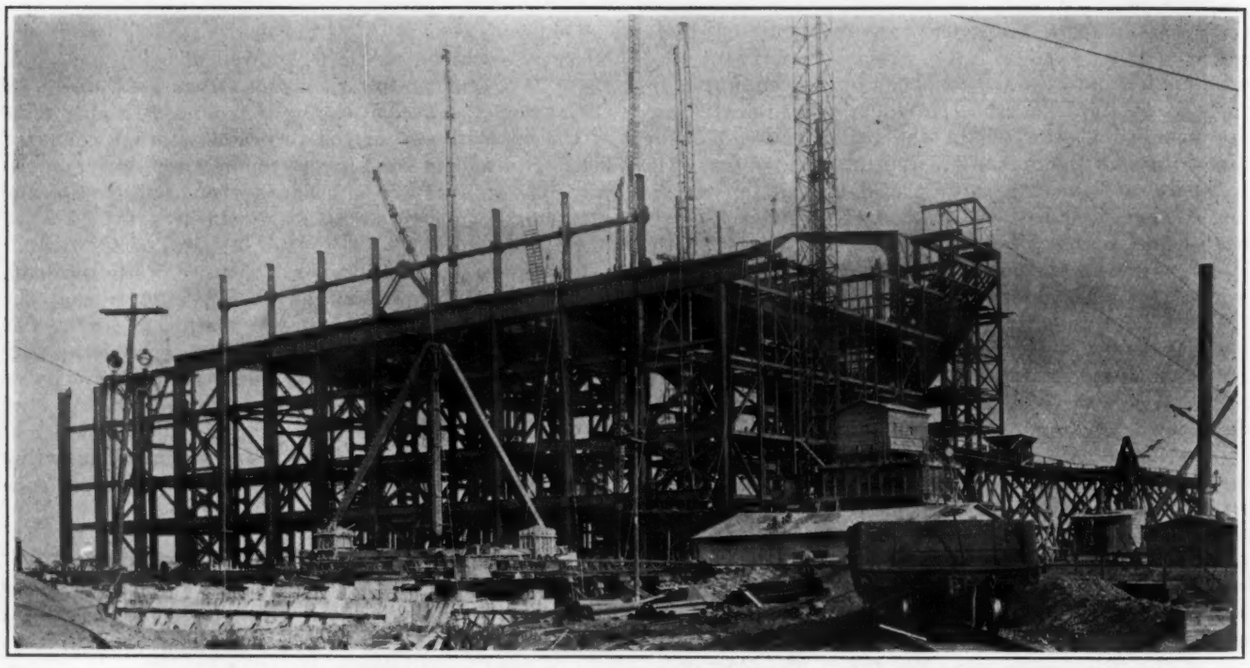
At Fisk Street it was necessary to dredge the Chicago River to permit landing of the vessel. To transfer the pieces to freight cars by which the remainder of the trip could be made to the Crawford Avenue station, special unloading facilities had to be provided. These included a giant shear leg operated by six motors and a steam crane mounted on a flat car.

Removal of the 67-ton low-pressure spindle, measuring approximately 20 ft. x 13 ft. x 18 ft. over all, was the most spectacular task, since only a few inches clearance was afforded in raising it through the ship's hatchway. The 29,000-kw. generator, for attachment to the intermediate spindle, was a heavier load but did not have such extreme over-all dimensions.

On account of the dimensions of some of the pieces it was necessary to place them on flat cars, which were moved to the Crawford Avenue station on Sunday. To obtain sufficient clearances in transporting these pieces it was necessary to move them over four railroads to reach their destination, although the distance between the two stations is short.

The Parsons unit comprises three elements—high-pressure, intermediate and low-pressure. The high-pressure end, which is rated at 16,000 kw., will receive steam at 550 lb. per square inch at a temperature of 750 deg. F. From this unit steam at 730 deg. F. and 95 lb. pressure will operate the 29,000-kw. intermediate element. The low-pressure element, rated at 6,000 kw., will receive steam at 4-in. vacuum.

The General Electric unit comprises a high-pressure and low-pressure element rated at 17,000 kw. and 43,000 kw. respectively. The first takes steam at 550 lb. pressure and operates at 1,800 r.p.m., the second at 110 lb. and 1,200 r.p.m.



FIVE UNITS TOTALING 205,000 KVA. TO BE INCORPORATED IN THE KEARNY PLANT IN NEW JERSEY

A high-pressure and low-pressure element also compose the Westinghouse unit, the former rated at 30,000 kw. The low-pressure end will operate at 105 lb. pressure and 700 deg. F.

In the case of all the units, steam leaving the high-pressure element will be preheated before entering the next element. This will be accomplished by an auxiliary series of tubes in the boilers. Air preheaters will absorb the heat from the flue gases and raise the temperature of air to the stokers.

With the various methods adopted in the Crawford Avenue station to insure the most economical use of heat energy, it is expected that it will be possible to generate energy with 1.5 lb. to 1.6 lb. of coal per kilowatt-hour, which will be 0.2 lb. to 0.3 lb. of coal per kilowatt-hour better than has been obtained in the Calumet station.

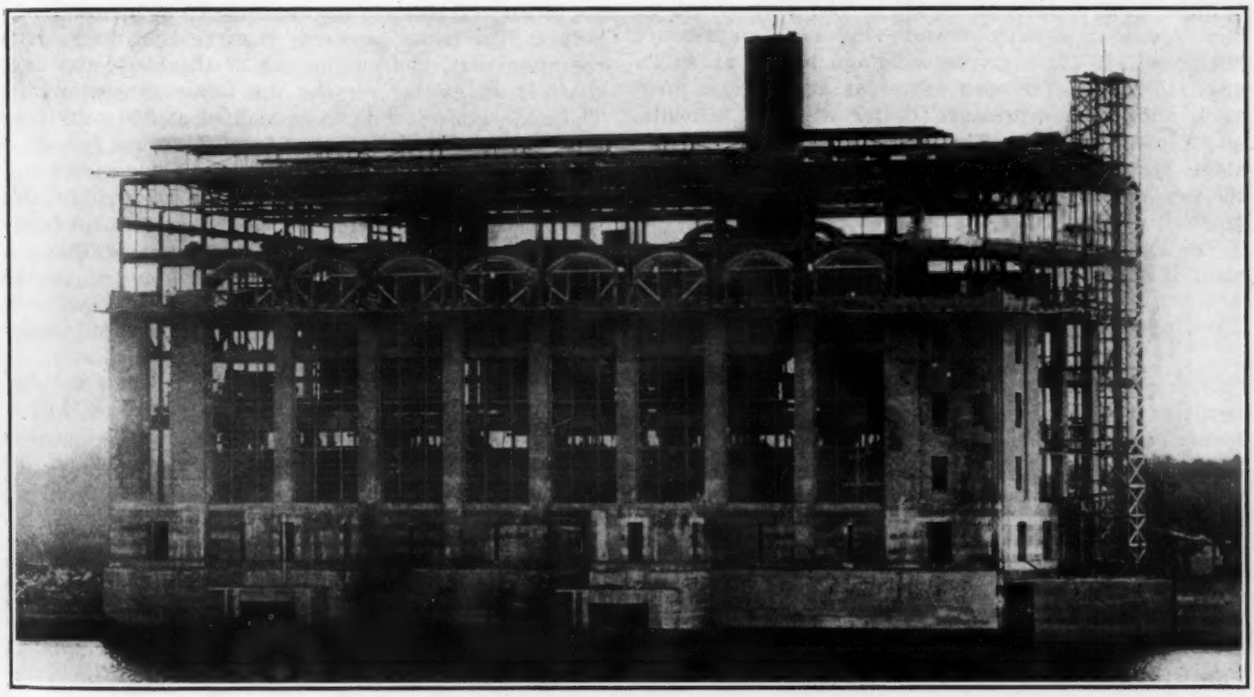
Although only about 57,000 gal. of water will be

required per minute for steam purposes, more than 80,000 gal. per minute will be required by each unit for condensation purposes. This will mean about 493,000,000 gal. of water per day. Circulating water will be taken from the Chicago Drainage Canal, on which the new station is situated, through a tunnel 12 ft. square and will be discharged through another 18 ft. high x 16 ft. wide.

Coal will be brought from southern Illinois mines and others and unloaded by car-dumping apparatus which will also weigh the car before and after dumping. The contrivance will be able to dump 120 cars per eight-hour day, or about 6,000 tons daily. Along the track from the dump to the storage territory, where several hundred thousand tons of coal may be stored to guard against mine or transportation tie-ups, there will be a gigantic traveling bridge which will transfer the coal to conveyors en route to the crushers.

Three of the units will be 39,200-kva. General Electric machines and two will be 43,750 kva. Westinghouse. These are designed for a throttle pressure of 325 lb. with 271 deg. F. superheat, giving a total steam temperature of 700 deg. F. Stoker-fired boilers are to be used.

In the initial plant to contain these five units the bunker house will be 236 ft. 5 in. long by 43 ft. 9 in. wide, the boiler house 206 ft. 3 in. long by 167 ft. 6 in. wide, the turbine room 283 ft. 8 in. long by 106 ft. 8 in. wide, and the switch house 184 ft. 10 in. long by 50 ft. 6 in. wide. The switch house will have six floors, isolated vertical-phase construction being used. Two self-supporting stacks, 250 ft. high, above the grates will serve twelve boilers, six to a stack. The stacks are constructed of steel, brick-lined, and have an inside diameter of 24 ft. 6 in. The Kearny plant will be utilized as a base-load station and will be connected by a high-voltage bus system with the Essex and Marion plants.



PEORIA PLANT OF THE ILLINOIS ELECTRIC POWER COMPANY

It is estimated that approximately 6,000 kw. will be required to operate auxiliaries in the initial section.

The boiler house and turbine room combined are 332 ft. long x 236 ft. wide. Two smokestacks, 26 ft. and 30 ft. in diameter, are provided. Adjacent to the turbine room is the transformer house, 300 ft. long x 46 ft. wide. Next to this is the switch house, 168 ft. long x 65 ft. wide.

It is expected that the General Electric unit will be in service by the middle of October and the two other units by the first of the year.

Kearny Plant Rated at 205,100 Kva.

In New Jersey the new Kearny plant of the Public Service Electric Power Company will have the largest initial generating capacity so far incorporated in any station. The first of five units now under order will be placed in operation early in 1925 and be followed every two months by another unit, the last unit to be ready a month after the fourth unit is in. This will make a total of 205,100 kva. The probable ultimate rating will be 410,200 kva.

The steam generating equipment will consist of twelve 2,360-hp. B. & W. boilers of the cross-drum type designed for a maximum pressure of 385 lb. and maximum rating at 350 per cent. These will be fired by six Taylor and six Riley stokers. The Taylor stokers are of the underfeed type, equipped with double-roll rotary ash discharge. Each stoker weighs 176,000 lb., is sixteen retorts wide and thirty-seven tuyères deep and will have a coal burning capacity of 30,000 lb. an hour under normal conditions. Both Riley and Taylor stokers are to be equipped with two-speed power boxes and driven by four-speed motors. The furnace width of the Taylor is 27 ft. 9 in. The Riley stoker is of the underfeed type equipped with single-roll rotary ash discharge and fifteen retorts. The width of the stoker is 28 ft. 4 in.

Nearly all of the auxiliaries will be electrically driven. No house turbines are to be installed, the power for the auxiliaries to come directly from the main generators. Two Westinghouse, two Allis-Chalmers and

one Wheeler condenser, each with a cooling surface of 50,000 sq.ft., are to be used. For each condenser there will be two motor-driven circulating pumps, each with a capacity of 38,000 gal. per minute. Two condensate pumps, one motor-driven and the other steam-driven, will serve each condenser unit. The feed pumps will be motor-driven with the exception of two spare units which will be steam-driven, the latter being connected to the feed-water system by a common header. There will also be one spare steam-driven circulating pump that will be able to supply any condenser by means of a common header.

Under normal conditions boiler-feed water will be heated entirely by bleeding from four stages of all the turbines. Three closed heaters and one open heater will be used in connection with each turbine. As the temperature in the open heater will be 212 deg. F. or above, it is expected that the oxygen in the feed water will be driven off in the open heater. The heaters will be bled from the following pressure stages: High-pressure heater at 135 lb. gage, second-stage heater at 40 lb. gage, third-stage or open heater at atmospheric pressure, and the low-pressure heater at 4 lb. absolute, all at average load. The high-pressure and second-stage heaters will drain into the open heater, while the low-pressure closed heater will discharge into the hot well of the condenser.

The estimated cost of the first step of the Kearny plant is $24,000,000.

Long Beach Station of Southern California Edison

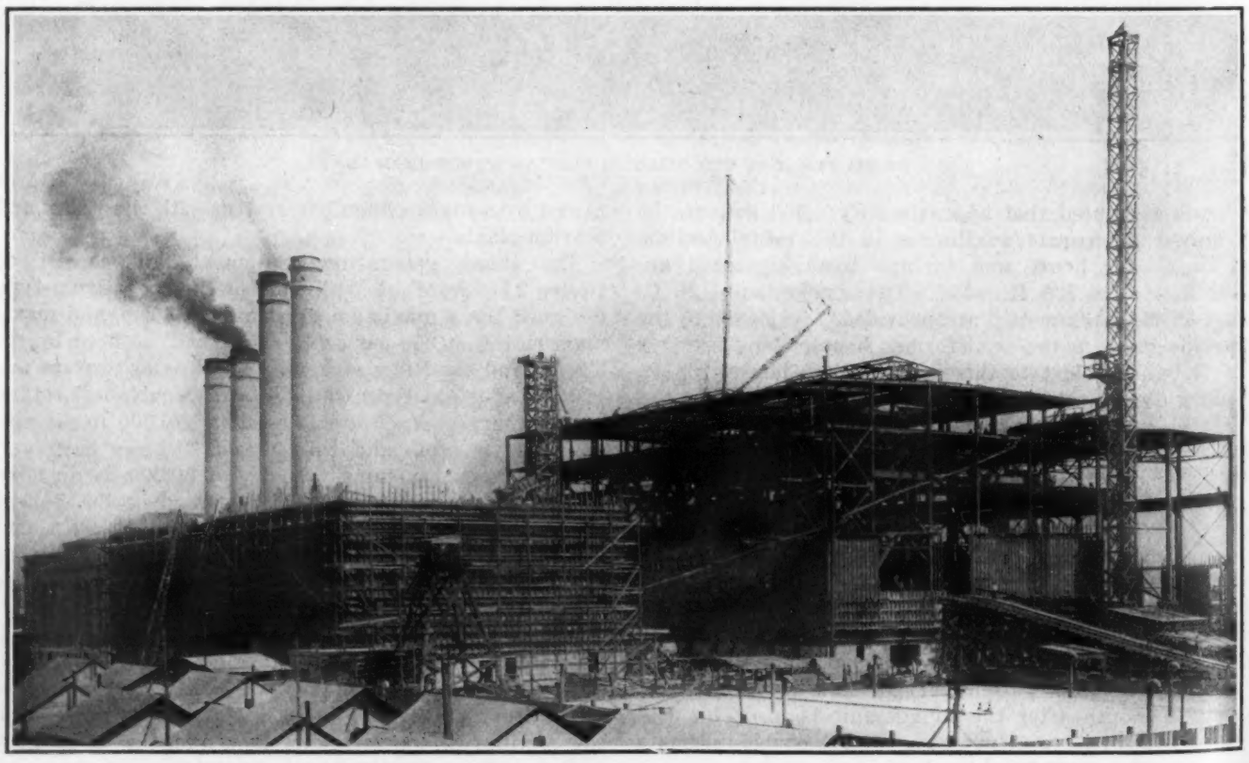
Owing to the very serious shortage of water and the resulting curtailment of hydro-electric power in California, the work on the Long Beach plant of the Southern California Edison Company has been carried on at topmost speed, and the first unit, which was to have been placed in operation next February, will be ready some time during November. The plant was started in October, 1923. When completed it will have a capacity of 100,000 kw. The first unit is a 35,000-kw. turbo-generator made by the General Electric Company.

Peoria Plant of the Illinois Electric Power Company

By December of this year the first 20,000-kw. turbo-generator of the Peoria plant of the Illinois Electric Power Company will be placed in operation, to be followed soon by a second unit of the same size. The plant will have an ultimate rating of 100,000 kw. Each unit is to be served by two boilers fired with powdered coal and to operate at a steam pressure of about 350 lb. with 250 deg. F. superheat.

In the generating end of the plant some interesting features are to be incorporated. The main units are rated at 25,000 kva. and are capable of carrying 23,500 kw., with maximum stage bleeding from four different points. The house generator is carried on the shaft of the main unit, and on the end of the house-generator shaft is an exciter serving the house generator only. The main generator is to be excited at 250 volts from motor-generator sets supplied from the house generator. Circulating, condensate and boiler-feed pumps are supplied from the house generators; the rest of the auxiliaries draw from the main bus through transformers. Normally, each house generator will supply the auxiliaries for its particular turbo-generator, but in case of failure of the house generator these auxiliaries may be operated from the main bus, the circuits being supplied with interlocking switches.

Current will be generated at 13,200 volts, and that portion of it intended for local consumption will be sent across the river at this voltage through submarine cables to the Peoria plant. Another portion of the station output will be stepped up to 132,000 volts to supply the Illinois Power Company at Springfield, Ill.



LONG BEACH PLANT IN CALIFORNIA TO MEET SHORTAGE OF POWER CAUSED BY DROUGHT

Conducting a Distribution Survey—II

Transfer of Field Notes to Permanent Maps and Records—Value of Survey to the Company—Results Obtained and Perpetual Inventory System

By E. G. NICHOLS* and J. R. EYRE†

A DISCUSSION of the forms used in field work in a survey of a distribution system was given in last week's issue of the ELECTRICAL WORLD and also the methods used to obtain the field data. Following this work there remains much to be done before conclusions may be made or full advantage be obtained from the data.

The mapping of the field notes was grouped under three headings, namely, primary, secondary and arc circuits. That is, for each map district three permanent maps were made—one showing the primary circuits, a second the secondary lines, and the third the arc system. The primary lines were drawn in orange-color ink, the secondary lines in red and arc circuits in green ink. In addition to the three circuits mentioned, the direct-current feeders, company telephone lines and high-tension lines were indicated on one of these maps, usually the primary map, each circuit taking a certain color and symbol (Fig. 2). From close analysis of the maps since they have been completed, it appears that the segregation of systems on three separate maps gives the desired information without congestion.

A completed permanent map of the secondary system is shown in Fig. 1. It indicates all poles, secondary circuits, transformers and service connections, but not the primary or arc circuits. All the poles in this map section are shown and each pole symbol indicates the ownership of the pole. Each pole is numbered and the height of it is represented by the small letter attached to the number. Poles were spotted to the same scale to which the map was drawn. Each secondary circuit is shown with its number and size of wire indicated, as, for instance, S-6, No. 8. Wherever a given circuit undergoes a change in wire size, that fact is recorded on the map by means of a symbol shown in Fig. 2. If a branch secondary circuit leads off from a main secondary run, that tap is indicated by a symbol and the branch circuit takes the same number as the secondary which it taps. If a secondary circuit cuts across another circuit as at street corners or the intersection of an alley with a street and there is no connection between the two circuits, this condition is indicated.

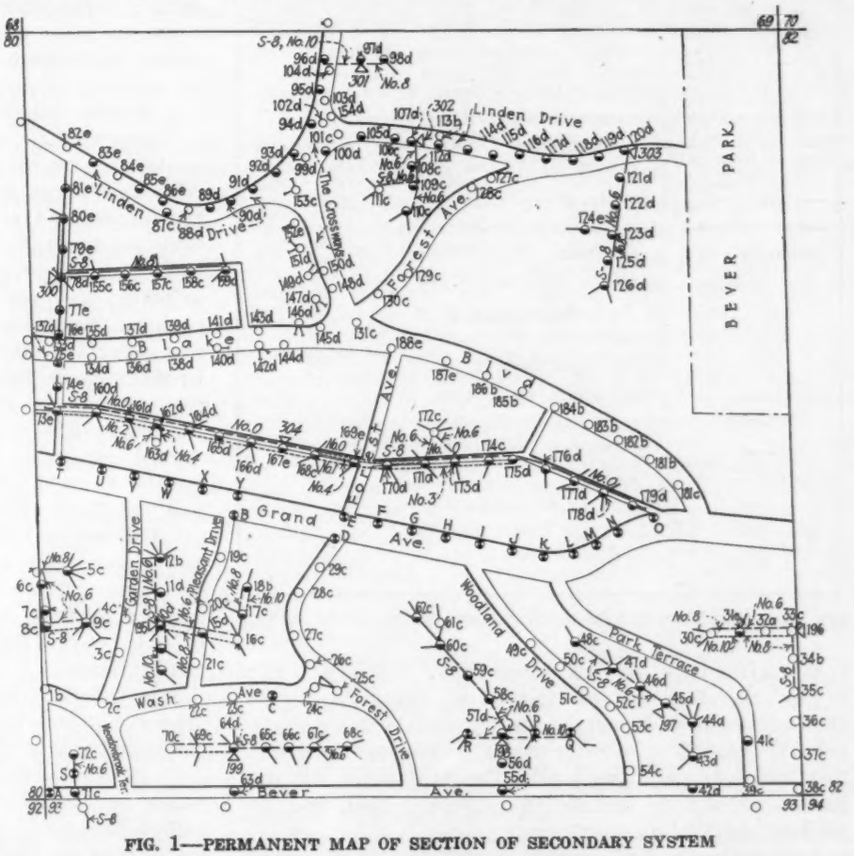


FIG. 1—PERMANENT MAP OF SECTION OF SECONDARY SYSTEM

Transformers are shown on the primary and secondary maps because a study of existing load conditions on the secondary as well as the primary involves the transformer ratings. A transformer is represented by a small triangle, the apex of which makes contact with the symbol of the pole on which the transformer hangs. The company number of the transformer is placed close beside the symbol, in red ink. If a bank of transformers exists, each symbol is accompanied by a figure which indicates the number of the circuit which the transformer feeds.

Customers' services are represented by short radial lines drawn from each pole. They indicate the number of customers connected to the secondary at the respective pole and the general direction in which the services run from the pole. The first of these two features was thought to be essential in calculating load conditions, on the assumption that an active service—and any service shown on the map is an active service—represents a certain demand. Services were not shown on the primary or arc maps.

The primary map indicates all the poles in that map section, but shows only the primary circuits and transformers to the exclusion of secondary and arc circuits.

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†Instructor in electrical engineering, State University of Iowa, Iowa City, Iowa.

Being less congested than the secondary map, however, it was also utilized to indicate the company telephone lines, high-tension lines and direct-current feeder circuits within that section.

The arc circuit map includes not only the wire circuits but the location of all street lamps and an indication of the type of mounting, such as center suspension, mast arm or bracket, these being represented by symbols given in Fig. 2.

A similar map was made up from the field inventory sheet and field map, but provision had to be made for new construction or removals undertaken during or after the surveys. Corrections were facilitated by the

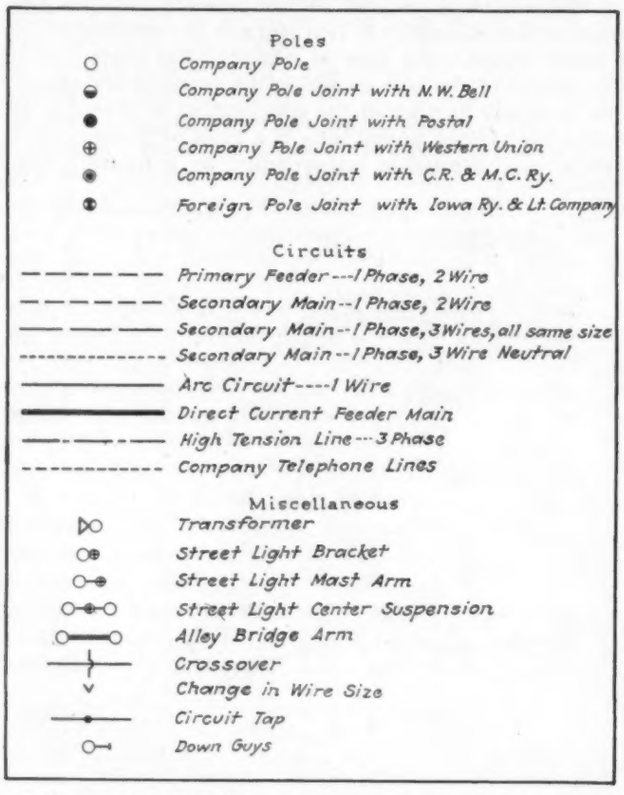


FIG. 2—LEGEND EMPLOYED IN MAPPING DISTRIBUTION SYSTEM

construction and service orders filled out and turned in by the foreman of the gang doing the work. Depending on whether the survey had been completed or not, the orders were used for correcting the inventory maps or filed away with the field notes for that particular section in case the complete map had not yet been drawn.

As the numbering of poles in each section was made in consecutive order and it was the desire to maintain consecutive numbers in so far as possible, new poles had to take the next available number if the sequence of numbers was to remain unbroken. Numbering of poles was facilitated by the use of the pole records previously mentioned, which indicated the idle numbers corresponding to poles taken out of service as well as the next consecutive pole number. The lower half of the pole record also gives the summary of the company's poles and foreign poles, as of any date, together with a distribution of the total foreign poles according to their ownership. Besides, the company's poles are classified according to the number of poles of different heights. Thus, from the pole-record card, one of which is made out for each map section, the number of company poles in use as of any date may be ascertained. At a glance one can ascertain how many poles are 20 ft., 25 ft., 30 ft. and so forth. It is possible to know on how many foreign poles the company's lines make contact and the direct ownership. By keeping the record up to date all idle numbers and letters should be utilized as fast as new placement permits.

VALUE OF THE SURVEY

In this particular survey it was known beforehand that conditions were probably worse than the average, but it was impossible to obtain quite the same perspective of conditions which was later obtainable from the completed map. Transformers were found with such a large number of house services connected to them as to indicate that they must be greatly overloaded. In other cases the number of services connected indicated plainly that the transformers were considerably larger than needed. Sometimes it was found that the transformers were situated at the ends or sides of the secondary district which they fed. Some transformers with a large number of services were connected two-wire; in other cases which were connected three-wire it was found that the loading on the three-wire system, as determined by the number of services connected, was greatly unbalanced.

Wires were found which appeared to be greatly inadequate to serve properly the district connected to them. Although wires were large enough in some parts of the secondary system, there were wires of smaller sizes between those districts and the transformer feeding them. A number of cases of parallel circuits, both primary and secondary, were found. With minor changes these duplications could be eliminated. This was especially true in the series street-lighting system. In many cases, rerouting of existing pole lines reduced the property investment sufficiently almost to pay for the improvement.

Pole ownership was also more definitely determined by the survey. For a number of years the records had not been checked and there were a number of cases where individual pole ownership was in doubt and had never been definitely established by any of the companies having attachments. Such a survey as this made a decision on these matters necessary, and the records were therefore put in a more definite and usable form.

The information secured as a basis for perpetual property inventory is in itself worth the effort. With the quantities of property units definitely determined and the addition and subtraction of these units accurately accounted for, the summary on the property record books will give at all times the exact status of the system as it stands at any one time. It merely remains to price these property units in order to have a complete valuation.

Finally, one of the most important facts brought out by the survey was that the city had extended beyond the limits of economic distribution at 2,300 volts. Some other means had to be provided not only to handle adequately the present load but also to provide the proper capacity for the needs of a rapidly growing city. And, best of all, the information for determining just what system is necessary is now at hand, and the problem can be tackled in a systematic engineering manner. True, a great deal of testing will have to be done on the present system and detailed analyses made, but the means for doing this is now greatly simplified by the information available in the completed volume of the distribution maps.

British Electric Power Supply

Progress Made in the Reorganization of Electricity Undertakings in the United Kingdom— Co-ordinating Present Systems

By HUGH D. BUTLER
Acting United States Commercial Attaché, London

REGARDLESS of whatever other satisfactory results the holding of the World Power Conference in London may have achieved, at least it succeeded in dramatizing the subject of electric power in Great Britain. Much of the discussion in the press was along the lines of the following argument: Electric power is to be the principal factor in the next industrial step forward, a step which the industrial nations have already started to take. Where does Britain walk in the procession? She led in the industrial revolution which followed the introduction of the steam engine, but other countries are ahead of her in the development of electric power.

Curiously enough, very little reference has been made in these arguments to the actual accomplishments to date in the reorganization of the electric power of the country; for instance, the claim of the Electricity Commissioners that electricity is now being generated at new stations recently installed in Glasgow and Manchester at costs comparable to the most efficient installations in the United States.

SUPERPOWER SYSTEM ADVOCATED

Excited by the report of the coal conservation committee of 1918, British writers and speakers are calling for a system of, say, thirteen superpower stations to make possible the complete electrification of England, Scotland and Wales, such stations to be located at coal mines to increase the efficient use of coal. Some propose also that these stations should be designed primarily for the production of coke and by-products, with electric power generation apparatus to utilize the coke.

Briefly, what has actually been accomplished since the armistice, while not startling in its effect on British industry and its costs, is of a very substantial and typically British character. As is well known, the development of electric power production and distribution in the United Kingdom has resulted in a large number of small stations of varying characteristics, differing voltages, etc., some operated by municipal authorities and others by privately owned public service companies. Without going into details, the electricity supply acts of 1919 and 1922 gave certain powers to a group of national electricity commissioners, appointed to coordinate the present electricity system and develop and expand it as rapidly as possible. Major-General Sir Philip Nash, in an article in the Manchester *Guardian Commercial*, tersely describes the work done by the commissioners in the division of Great Britain into fifteen districts, which altogether include 90 per cent of the total number of kilowatts generated in the country at the present time, as follows:

> The initial work of defining provisional electricity districts was followed by investigation into the conditions obtaining in those districts with a view to determining finally their administration, either under an advisory board which would simply act as a central committee for consultation regarding developments within its area without executive power, or into a definite joint electricity authority. It is important to make this distinction between the advisory board and the electricity authority, since under the former the various undertakings preserve almost entire independence and simply use the advisory board in matters referring to a general policy to be adopted throughout the area. The advisory board in this case acts as an intermediary between the electricity commissioners and the individual undertakings. The joint electricity authority is, on the other hand, to all intents and purposes, a body with full administrative powers and may control a district in consultation with individual undertakings.
>
> The advisory board has been found to be the most suitable form of centralized administration, since under it the independence of each authority is not threatened and the advantages of a centralized policy combined with private initiative are realized. The first three districts to be definitely determined were the Southeast Lancashire and the Southwest Midlands and the Mid-Lancashire districts, and in every case the conciliation of the interests of the private supply companies with the interests of the municipalities has been carried out with almost complete success. Under such an advisory board, every local authority, company or person proposing to extend or alter the plant capacity of a generating station, to construct a new generating station, or extend or alter main transmission lines, shall submit details, plans and estimates to the committee. The committee or board may make recommendations regarding the adjustment of running hours of the generating stations to insure maximum economy in the production of electricity.
>
> The Southeast Lancashire district covers the most important part of Lancashire and includes Manchester, Salford, Oldham, Rochdale, Stockport, Wigan, Stalybridge, Bolton and Bury municipal supply undertakings, as well as some part of the area within the control of the Lancashire Electric Power Company. It has generating plant of a total capacity, ultimately, of about 550,000 kw., or more than one-seventh of the total present generating plant in the country.
>
> The Southwest Midlands district, controlled by an advisory joint committee, comprises Birmingham, Smethwick, Worcester, Dudley, Redditch and Kidderminster and has at present a total generating plant of a capacity of about 180,000 kw., to be extended ultimately to about 400,000 kw. through erection of a new generating station at Hams Hall, near Birmingham, and extension to the Nechells power station in Birmingham.
>
> The Mid-Lancashire district includes the important textile areas in Northeast Lancashire comprising the towns of Preston, Blackburn, Burnley, Rawtenstall, Colo, Nelson, Darwen and Accrington. The cotton mills at Blackburn have a power consumption at present of about 7,118 hp., with further extensions aggregating 6,068 hp., while chemical factories, paper mills and collieries constitute an important source of demand. Under the scheme now arranged, the normal capacity of the eleven stations in the area will be 61,850 kw., with a maximum demand of 47,850 kw. by 1926. This capacity is estimated at 90,350 kw., with a maximum demand of 85,350 kw. by 1931. To obtain this, a new station of 12,000 kw. at Preston should be in operation before 1926, and a new station at Padiham of 12,000 kw. before 1931, while extensions should be carried out at Rawtenstall, Nelson, Fleetwood and Blackpool. It is doubtful whether the realization of the scheme will correspond to that already estimated, but the potentialities of the district under normal trade conditions are such as to justify even the higher estimated capacity given.
>
> A fourth district, the most important in Britain, has

been virtually determined—namely, the London and Home Counties Electricity district. In the case of this district three conflicting interests had to be conciliated—the metropolitan borough councils, the extra-London local authorities and the London supply companies. This district is responsible for almost one-quarter of the total number of units generated in the country, and the private supply companies are responsible for slightly more than one-half of the power generated in it. In the case of the private companies, which have been responsible for some very important developments in the area, the main difficulty lay in the fact that the London electricity administrative body as originally suggested ceased to be a purely advisory body and became a joint electricity authority with the administrative powers invested in such an authority by the two acts of 1919 and 1922. It was felt in this case that the constitution of such an authority would be detrimental to the interests of the private companies, and a long legal dispute ensued. The arrangement that is now proposed is based on the proviso that the tenure of the companies has been extended until 1971, when the undertakings run by the private companies become the property of the joint electricity authority. At the present moment a joint electricity authority is to be formed, consisting of twenty-seven members, twenty-one of which will be elected publicly, two members representing the supply companies and twelve the local authorities. A technical advisory board will be set up for the whole district, and this board will act in conjunction with the electricity authority.

Investigations have also been made in certain other districts, but the work has not yet been completed.

POLICY OF CONCILIATING VESTED INTERESTS

Sir Philip Nash expresses the opinion that the work thus far accomplished by the Electricity Commissioners has proceeded as rapidly as circumstances will permit, and he believes substantially vindicates the original policy of "conciliating present interests" rather than imposing compulsory legislation. He thinks that "in future years Britain should be electrically one of the most highly organized countries in the world."

It is British policy always to take things as they have come down through the ages—and one sees evidences of the feudal era in many British customs and places—and to build thereon carefully and conservatively. This policy is in evidence in the electric supply field, where the co-ordination of privately owned and publicly owned plants and services is going forward with careful regard for all established interests.

Undoubtedly there are also other powerful groups who do not agree that the "policy of conciliation" which has thus far been adopted is as advantageous to the whole country as compulsory powers to enable the state to develop a superpower scheme in the near future which could only be brought into being by the enforced purchase and amalgamation of many of the small private distributive systems in the country into a new big scheme.

The government of the day has not as yet stated a definite policy on this subject. Its declared general policy toward industry is one of state ownership and operation of public utility services. As a political issue, the whole question has been precipitated by the recent publication of a Liberal party book, "Coal and Power," the report of a committee headed by Lloyd George, which reveals the policy of this party as regards the future of the coal industry and electric power as a subsidiary thereto. It is not unlikely that this subject may be an important issue in a future election.

According to the figures made available by the Electricity Commissioners, electricity is now generated at two recently installed stations, Glasgow and Manchester, as follows:

	COST OF ELECTRICAL ENERGY	POUNDS OF COAL PER KW. GENERATED
	Pence per Kw.	Lb.
Glasgow	0.289	1.80
Manchester	0.183	1.54

In the first part of the table the figures are exclusive of capital charges, but include fuel, labor, materials and repairs. Two factors, however, must be taken into account when examining these figures—first, that the two British installations are absolutely new and do not therefore include the normal amount for maintenance, and, second, that it is not certain to what extent, if any, adjustment has been made for the possible differences in calorific value of the coal used in the two plants mentioned.

When questioned on this subject, an eminent American authority said that he would expect this to be the case, as new a British generating plant would have as great efficiency as would American and should not cost more—the price of coal at the mine is lower than in the United States and the haul shorter. Moreover, it is well known that British labor costs are substantially lower than American.

MOUTH-OF-MINE PLANTS

As to the popular English opinion that electric power generation plants should be located at the coal mine, the Electricity Commissioners found after careful investigation that it was advisable to locate stations in the coal fields in some instances, but not in others. Installations in Yorkshire, Nottinghamshire and Leicestershire will be in the mine fields. In other cases plants are located anywhere from 5 miles to 20 miles from coal supplies, when the advantages of a satisfactory water supply and proximity to the market for power and light have outweighed the gain to be had from location at the pithead.

Then, again, the Electricity Commissioners found that there is a limit to the efficiency to be gained from the installation of a few huge plants in a district, several smaller ones producing better results, in their opinion.

When consideration is given to the more efficient use of coal and the development of electric power as an auxiliary thereto, the position in the dye markets of the world must naturally be considered, dyes being the most valuable coal by-product. As has been pointed out by a dyes expert of the Department of Commerce, in a trade information bulletin entitled "British Dyestuffs Industry," the war-time development of chemical and dye industries in Germany, the United States and Great Britain has been such as to provide capacity for between two and three times the supply of dyes for which there is a world market. The British dye industry would, therefore, have to expand its market still further for dye products under these severe competitive conditions, in order to make the production of coal by-products at the mine practicable.

Far-seeing observers in Great Britain are more concerned over the question of the increase of hydro-electric power plants in foreign competing countries and the knowledge that Britain has but slight natural resources to utilize in such a race. However, they are fully aroused to the necessity for the more efficient use of British coal resources, and there is no doubt that the advance made at Glasgow and Manchester is the forerunner of a steady improvement in electric power generation throughout Great Britain.

Letters from Our Readers

Difficulty of Estimating the World's Water Power

To the Editors of the ELECTRICAL WORLD:

My attention has been drawn to an article in the September 13 issue of the ELECTRICAL WORLD entitled "The World's Natural Power Resources." The writer of this article apparently has derived the statistical data from papers submitted through the World Power Conference in London. However, statistics are liable to be misread or misunderstood, and on looking through the table at the bottom of page 511 it becomes evident by taking only a few representative cases that the table contains several serious misstatements.

As I arrived from Europe only about two months ago, I have not yet received papers pertaining to the conference, and I am not able to point specifically to what mistakes have been made, but I think that on comparison of the following figures with data undoubtedly already in your possession you will agree that something is radically wrong which undoubtedly, in the interest of your subscribers all the world over, you would like to correct.

Being a Norwegian citizen and having for a number of years been intimately connected with the power development in that country, I will first deal with the figures given for Norway. The total potential water power is given as 12,300,000 hp. This figure agrees with my notes, only it might be added that it is figured on the basis of twenty-four hours per day. This figure does not include plants aggregating less than 1,000 hp. I mention this point because in the past it has been neglected, thus making the table give a false picture of the situation. To mention an example which occurs to me at the moment, about a year and a half or two ago a table comparing the water-power resources in Europe was given in your journal. At that time the figure for Switzerland was given as 4,000,000 hp.; however, it was not mentioned that this figure was based on a fifteen-hour load per day, while the corresponding figure for Norway given in the same table was based on a twenty-four-hour load. I believe you will appreciate the importance of bearing this point in mind when making statistics.

Under "total developed water power" 1,300,000 hp. is given. At the end of the year 1923, however, the total installed water turbines amounted to 2,200,000 hp., distributed in about 2,400 power stations. The only way I can account for the figure given in your table is that there is installed at present in Norway 1,300,000 turbine horsepower on a twenty-four-hour-day basis for general electrification purposes—that is, only for lighting and cooking purposes—while power for the heavy industries amounting to about 1,000,000 hp. has not been included.

With regard to Sweden I do not have the exact data as to the total developed power; however, from my knowledge of the electrification in that country I am sure that this figure should only be about 1,500,000 hp. In any case the figure of 3,421,000 hp. as given in your paper is altogether out.

Lastly, I will draw your attention to the figures given for Great Britain and Ireland, namely, 250,000 hp. This figure is absolutely wrong. The total developed water power in Great Britain probably does not exceed 3,000 hp. To my knowledge there exists only one station of any importance, namely, that belonging to the British Aluminum Company at Kinloch Leven, Scotland, the total capacity of which as well as I remember does not exceed 2,500 hp.

I should like to mention that the principal reason prompting me to write you in regard to this matter is the wide distribution and the high standing of your journal in the international electrical field. Because of this misleading statistics printed by the ELECTRICAL WORLD cause confusion and annoyance.

Wilkinsburg, Pa. OLAV MASENG.

[Discussion of the world's power resources at the recent World Power Conference in London tended to make clear the need that exists for some definite, uniform or standard method of stating the water-power capacity of a stream so that adequate comparisons may be made. In reviewing the various World Power Conference reports on power resources, too, it is found that almost every basis of measurement was employed. Worse yet, in many cases the standard of measurement was not given. Another point brought out at the conference was that most power surveys have been neglecting the smaller water powers. In the case of the data for the developed water powers of the United States, for example, only plants whose rating is 75 kw. or over have been included. It was estimated in 1922 that there were 30,935 plants in this country under 75 kw., with a total rating of 1,092,000 kw. or an average rating of 35.4 kw.

A check of the reports to which Mr. Maseng refers indicates that the data as given in the article in the ELECTRICAL WORLD were correct transcriptions of the figures given by the representatives of the various countries at the conference with one exception. The figure of 3,421,000 hp. given as the developed horsepower of Sweden was an error, the correct figure appearing elsewhere in the article as 1,416,000 hp.—EDITORS.]

Effect of Higher Entrance Requirements in Our Universities

To the Editors of the ELECTRICAL WORLD:

The remarks of George F. Marsteller of Boston on "Why Engineers Are Underpaid," in your September 6 issue, are interesting to a certain degree. However, whether the solution of the problem will be reached by the means suggested is doubtful, at least so it seems to me.

Will adding one or two more years to the college course improve the financial condition of young men without means? It may reduce the attendance at the colleges adopting the suggested higher entrance requirements or having a five-year or six-year course, but would it have the desired effect? Would it not, rather, result in increasing the attendance at the second-class or third-class schools, thus also "causing economic suicide"?

As for "some form of a protective organization," let us hope Mr. Marsteller does not mean unionism as practiced by some of the labor unions in this country. He commends "the reasoning of a bricklayer"—well, I've met a good many union men of the building trades, also men and women of the textile unions. Most of them have very little reasoning power; they follow blindly a loud-mouthed semi-anarchist. I know; I was one of them. But never again a union, so help me Allah! W. MCDANIELS.

Waupun, Wis.

Central Station and Industrial Practice

Copper Shunts Used with Switchboard Meters

By R. D. Turgeon
Testing Department, Commonwealth Edison Company, Chicago

UNDER certain conditions a copper shunt used in conjunction with a compensating coil will give as good instrument accuracy for direct-current switchboard ammeters as the alloy shunt will. When large-capacity shunts are required, say from 1,000 amp. up, the use of the bus copper as a shunt is advantageous for several reasons. These are:

1. Lower cost of material—alloy shunt eliminated.
2. Lower cost of installation—no cutting, drilling or fitting of copper to the alloy shunt.
3. Greater factor of safety—elimination of heating at joints and between shunt leaves and terminals.
4. Greater flexibility—capacity of circuit can be changed more readily.
5. Installation is more clean-cut, open and accessible.

For these reasons the copper shunt and compensating coil have been installed in all generating stations and substations of the Commonwealth Edison Company for feeder ammeters, where the highest accuracy is usually not required. The method is equally suitable for other heavy circuits—for example, rotary converter or battery circuits—if a good length of copper is available for the shunt. For small isolated installations the alloy shunt would probably be better, but for central stations or other large installations the compensating coil has the advantage.

The conditions necessary for high instrument accuracy are sufficient length of shunt, application of the compensating coils so they will respond to the temperature changes in the shunt, and distribution of the coils along the shunt in such a manner that the resistance change will be proportional to that in the shunt itself. Although a high accuracy can be obtained by observing these requirements, it is not necessary or practicable to observe them to the letter. Modifications can be made and good results still obtained. The installation will then have virtually all the advantages outlined at some sacrifice in accuracy.

For example, busbar copper has a conductivity of better than 98 per cent and a temperature coefficient of approximately 0.4 per cent per degree C. If a section of busbar is used for the ammeter shunt which is just long enough to give a potential drop at full-load current rating equal to the ammeter drop at that current value, no compensation is possible

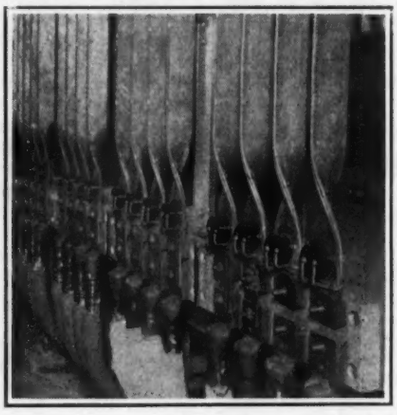


FIG. 1—BUSBARS EQUIPPED WITH COMPENSATING COILS SERVE AS SWITCHBOARD METER SHUNTS

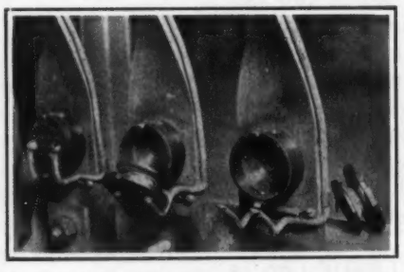


FIG. 2—METHOD OF MOUNTING COMPENSATING COILS

Coil consists of No. 30 magnet wire inclosed by molded-insulation case and connected to busbar at points about 10 ft. apart. Note method of attaching lead wires to bus.

and the instrument indication will be in error owing to the heating of the bar and the consequent increase of resistance. For a 3-in. x $\frac{3}{8}$-in. bar carrying 1,000 amp. this will be about 6 per cent. If twice this length of bar is used, the drop at rated current will be twice that of the ammeter, and therefore a coil may be used having a resistance equal to the ammeter resistance. As only the coil will change in resistance because of the heating of the bar, 50 per cent of compensation is the maximum that can be obtained, but the instrument error is reduced to 3 per cent. With still greater length of busbar used as a shunt, more compensation will result.

At the ordinary current density used in practice 10 ft. or more of busbar will give a very satisfactory shunt. One compensating bar will usually be sufficient, but on very long shunts, or on shunts which on account of location may be at quite different temperatures at opposite ends, two coils would be better.

In making the initial calibrations it is only necessary to calculate the shunt drop at a given current value and adjust the compensating coil, which is in series with the ammeter, so that the instrument will read correctly at this value. Both busbar and cable as manufactured are close enough in dimensions and conductivity to permit tables to be used to simplify the calculations. In field testing of instruments in service still better accuracy can be obtained if the adjustments are made at a temperature of the shunt corresponding to full load. This would particularly apply to those cases where the length of shunt is shorter than is desirable for the best compensation. At current values and temperatures below full load, the tendency would then be for the instrument to read slightly low, but not by an amount which would be objectionable for this fraction of the full scale reading.

Overcoming Faulty Governor Operation

CONSIDERABLE trouble was experienced in obtaining proper governor action on a turbine-driven circulating water pump at the Wichita Falls generating station of the Texas Power & Light Company, due to vibration causing wear on all the parts, especially the valve stem, which could be kept steam-tight only with great difficulty. The governor was of the fly-ball type, mounted directly on the end of the main shaft. The governor-weight stem was connected to the governor valve through a lever arm which was

mounted on a long slender bracket bolted directly to the top bearing shaft on the front end of the turbine. One end of the governor stem was acted on by the governor weights through knife-edge fulcrum blocks. This stem also carried the main spring. The outer end of the stem was supported by small ball bearings carried by the connecting lever, the other end of which engaged and operated the valve stem.

The long overhung bracket carrying the lever arm was very light and flexible, causing the whole governor simply to vibrate. This condition was aggravated by the outboard-end governor-stem bearing being fastened to the lever arm, which had to be free to move back and forth with as little friction as possible. Of course, it could not hold the stem bearing steady if there was the slightest tendency to vibrate.

This governor arrangement should have been balanced to run without excessive vibration at certain speeds, but frequently the pump speed had to be regulated to suit the load on the main turbine so that the unit could never be operated at one speed. Consequently it was decided to mount the governor stem bearing and lever arm on a pedestal separate from the turbine. This pedestal holds the bearing and lever arm more securely and also reduces the tendency to vibrate which existed with the overhung bracket. Instead of fastening the outboard-stem bearing to the lever arm, it is carried in a slide on the pedestal and is free to move in and out with and parallel to the governor stem. A fork on one end of the lever arm engages two small pins in the bearing and transmits the motion of the governor stem to the valve stem. This fork is the same as the one on the other end of the arm which engages the valve stem.

This changed arrangement has been very satisfactory, no further trouble having been experienced from leaky valve stems or undue wear on the governor gear.

Comparative Cable Wear with Different Types of Duct Endings

BY F. L. ROHRBACH
Engineer Underground System, Washington Water Power Company, Spokane, Wash.

THE question of wear on the lead sheath of cables at duct endings is a subject that has caused much concern to the underground engineer. Several methods are in general use for mitigating this wear, one such method being described by the writer in the December 8, 1923, issue of the ELECTRICAL WORLD, page 1165.

To determine the comparative amount of wear on the lead sheath of cables with different types of duct endings, the following experiment was made by the Washington Water Power Company. Pieces of 1,000,000-circ.mil, 4/32-in. lead-covered cable were placed in the various types of duct shown in Fig. 1 and listed below, and were periodically caused to be pushed out of the duct end 1⅜ in. and then pulled back. The time for one cycle (out and back) was 19 seconds, divided as follows: 5 seconds out, 9 seconds at rest and 5 seconds returning. The cables were arranged so that they were supported 2½ ft. from the duct edge. The types of duct ends used were:

1. Fiber duct, belled end with roller support; minimum diameter of roller, 1¼ in.; roller set back from duct end to allow fire protection for the duct.

2. Fiber duct with roller support; minimum diameter of roller, 1 in.; roller removed and hardwood support used instead, held in position by slots in the wood which fit over the bearings.

3. Fiber duct, usual construction.

4. Cement-finished; one part of cement to two of sand, with bottom rounded off to fit curvature of cable.

5. Fiber duct with lead collar placed under the cable.

6. Tile duct.

The test was run for 7,000 cycles, which is equivalent to about ten years of wear under actual operating conditions.

The results of the test are as follows:

1. At the end of 7,000 cycles the lead sheath on the roller showed practically no wear, except a slight tendency to flatten.

2. The wood used in this test was oak with the grain running with the cable. No cuttings showed, but there were slight ridges in the sheath caused by the parallel grains in the wood. Softer or closer grained wood should prevent this.

3. The fiber duct cut the lead sheath until the duct was worn off to a round shape and polished. Small cuttings of the lead sheath were from ⅛ in. to 7/16 in. long.

4. The cement-finished duct wore gradually and continuously, the lead sheath being worn about two-thirds through over a length of approximately 3 in.

5. The lead collar moved out and in with the cable, the wear being all on the lead collar. This test was discontinued after 1,500 cycles.

6. The tile duct cut very fast, being worn one-half through in less than 1,500 cycles. This test was discontinued.

An automatic counter was used to record the cycles accurately. The test was not continuous, but was run one to three hours at a time. The conditions under which the test was made were such that less wear was produced in a given number of cycles than would occur in actual operation under conditions prevailing in manholes. The temperature was only about 70 deg. F., whereas under operating conditions this might have been 150 deg. F. or more. The duration of the test was very short as compared with the time required to make the same number of cycles in actual operation. The cables did not therefore sag down because of the constant jarring and with the passing of time, as would have occurred in actual practice. Further-

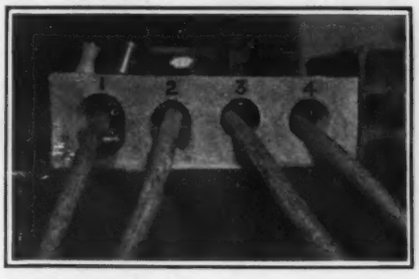


FIG. 1—SET-UP FOR TEST TO DETERMINE CABLE-SHEATH WEAR AT DUCT ENDS USING VARIOUS TYPES OF DUCT

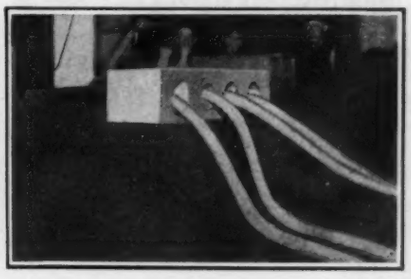


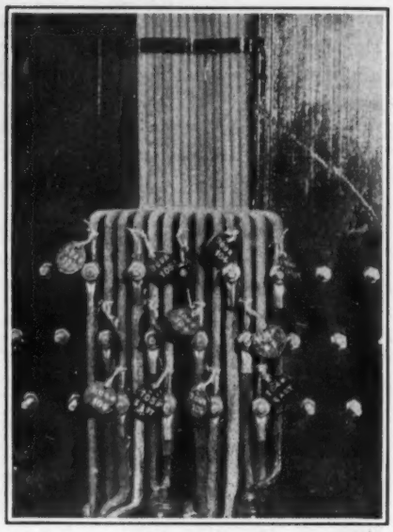
FIG. 2—MACHINE FOR PRODUCING PERIODIC MOTION OF CABLES TO CORRESPOND TO TEMPERATURE CYCLES

more, in manholes there are the unfavorable conditions of flooding and sediment, dust and particles getting under the lead sheath.

This test, in the opinion of the writer, shows conclusively the necessity for some kind of a duct-ending device which will allow free movement of the cable at duct ends without undue abrasive action.

Rewired Switchboard at Hartford Plant

RECENT improvements in switchboard instrument design and in wiring at the South Meadow generating station of the Hartford (Conn.) Electric Light Company illustrate noteworthy progress in this field. Increased accessibility of control and instrumental circuits has been obtained by eliminating concealed connections, installing terminal boxes near the bases of panels and running open wiring in easily followed paths between systematically spaced binding posts connecting instruments and relays with conduit leads from the benchboard and other points. A type of voltmeter and wattmeter lately brought out in response to the Hartford company's suggestions carries the necessary resistance element, as an integral part of the instrument, simplifying the rear of the panel mounting and greatly improving its appearance.



TERMINAL BOX WITH COVER OFF SHOWING CONNECTIONS AND METHOD OF TAGGING

The relay current transformers have been redesigned, cutting out the saturated core feature, and terminal boards have been redesigned. All cross-connections between the front and rear switchboard panels have been done away with, and 25 per cent of the former wiring behind the panels has been eliminated. The terminal boxes are provided with bakelite covers, and permanent test blocks for relay checking have been installed on the backs of the appropriate panels. Rewiring was done by the station staff supervised by the company's engineering department.

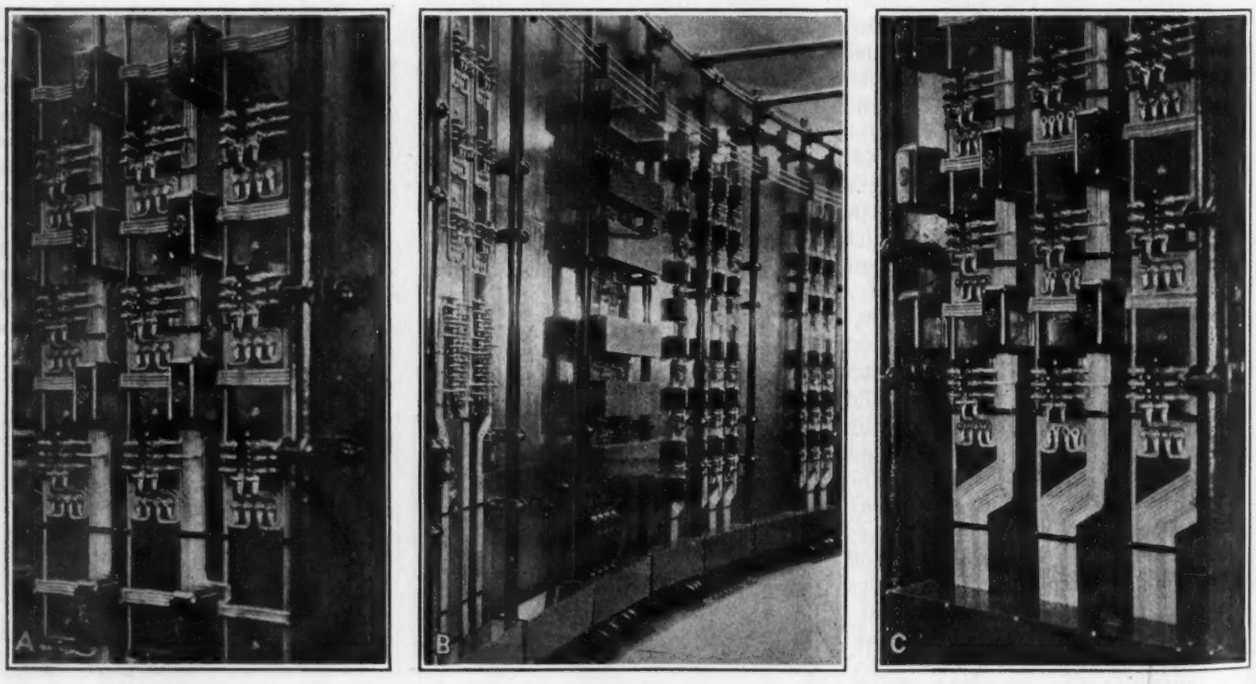
Regenerative Braking of Induction Motors

BY K. L. HANSEN
Electrical Engineer, Milwaukee, Wis.

WHEN considering motors that must accelerate and retard loads of appreciable inertia at frequent intervals, as illustrated by elevators, hoists, centrifugal extractors, etc., the showing in regard to energy consumption is much inferior to that of constant-speed operation. In such applications the induction motor appears to be at a disadvantage compared with the direct-current motor.

A quite high efficiency of acceleration and retardation may be obtained by combinations of direct-current machines, but the low efficiency which is an inherent characteristic of the induction motor when operating at speeds differing widely from synchronism, unless commutating devices are employed, makes its efficiency in intermittent service essentially a poor one.

It has frequently been pointed out that regenerative braking is possible when a two-speed induction motor is used in one of the applications mentioned. For example, if the machine is running near synchronous speed of the high-speed winding and the connections are changed to the low-speed winding, the motor operates as generator, develops a braking



INCREASED ACCESSIBILITY OF CONTROL AND INSTRUMENT CIRCUITS IN REWIRED BOARD AT SOUTH MEADOW PLANT

A—Back of relay board with terminal boxes and conduit risers.

B—Detail of top section back of relay board of typical 11,000-volt feeder panel.

C—Detail of bottom section of 11,000-volt feeder and relay panel.

torque and returns energy to the line until synchronous speed of the low-speed winding of the machine is reached.

However, investigators discussing this question usually fail to bring out the quantitative relation between the stored energy and the energy returned to the line and therefore give the impression that the efficiency of regeneration of a two-speed induction motor is comparable to that which may be attained by direct-current machines. But a simple approximate quantitative analysis will show that, although the motor develops a powerful braking torque when operating in this manner, comparatively little energy is returned to the line. In other words, when slowing down from a speed much above synchronism, the motor is an effective but inefficient brake.

When running at a speed of S revolutions per minute, the energy stored in the moving parts is known to be $W\ G^2\ S^2/5{,}870$ ft.-lb., where W is the weight in pounds and G is the radius of gyration in feet. Expressing the stored energy in watt-seconds gives:

$$W\ G^2\ S^2\ /\ 4{,}324 \qquad (1)$$

When the friction load is small compared with the inertia load it can be shown by mathematics that the energy losses in the primary and secondary of the induction motor are given in the two following equations:

$$W_P = [WG^2N^2(S_1^2 - S_2^2)r_o]/(4{,}324r_1) \qquad (2)$$

and

$$W_S = [WG^2N^2(S_1^2 - S_2^2)]/4{,}324 \qquad (3)$$

Where W_P and W_S represent the energy losses in the primary and secondary respectively, N equals the synchronous speed, S_1 and S_2 the slips considered, r_o the primary resistance per circuit and r_1 the secondary resistance per circuit reduced to primary turns.

Comparing (3) with (1), it will be seen that when a motor accelerates from standstill to synchronism the secondary energy loss is equal to the stored energy and the primary loss is the stored energy multiplied by r_o/r_1. As the secondary loss is independent of and the primary loss inversely proportional to the secondary resistance, it follows that the ratio of secondary to primary resistance should be as high as the rate of acceleration permits in order to reduce the energy loss of the system to a minimum.

To illustrate, consider a motor supplied with two primary windings of eighteen and six poles—that is, of synchronous speeds of 400 r.p.m. and 1,200 r.p.m. respectively. Assume that $r_o/r_1 = 0.5$ and that inertia of motor and load $WG^2 = 100$. When accelerating up to 400 r.p.m. the energy wasted in the secondary is $(100 \times 400^2)/4{,}324$, or 3,700 watt-seconds, and the energy wasted in the primary is $(0.5 \times 100 \times 400^2)/4{,}324$, or 1,850 watt-seconds, a total of 5,550 watt-seconds.

When accelerating from 400 r.p.m. to 1,200 r.p.m. (from $S = 0.667$ to $S = O$), the energy wasted in the secondary is $(100 \times 1{,}200^2 \times 0.667^2)/4{,}324$, or 14,800 watt-seconds, and the energy wasted in the primary is $(0.5 \times 100 \times 400^2 \times 0.667^2)/4{,}324$, or 7,400 watt-seconds, a total of 22,200 watt-seconds. The energy stored at 1,200 r.p.m. = 33,300 watt-seconds. The total energy input during acceleration is equal to the stored energy plus losses, or 61,050 watt seconds.

The energy given up in slowing down from 1,200 r.p.m. to 400 r.p.m. is 29,600 watt-seconds and the energy wasted in slowing down from 1,200 r.p.m. to 400 r.p.m. is 22,200 watt-seconds. Therefore the energy returned to the line is 7,400 watt-seconds.

As no energy is used in overcoming a friction load, the ratio of energy returned to the total energy input may be taken as the efficiency of acceleration and retardation and in this case this efficiency is equal to 12.1 per cent.

The net energy input is 53,650 watt-seconds. To accelerate a single-speed motor to 1,200 r.p.m. would have required 83,250 watt-seconds. From the standpoint of energy consumption the two-speed motor is therefore markedly superior to the single-speed motor, but is much inferior to certain combinations of direct-current machines in which over-all efficiencies of acceleration and retardation of at least 50 per cent or higher may be obtained in practice.

Transformer Records

TO SYSTEMATIZE the practice of maintaining transformers and to co-ordinate methods of inspection and record of this equipment the Worcester (Mass.) Electric Light Company has formulated detailed instructions as to procedure. Through the courtesy of George M. Hardy, general superintendent, the following instructions on the keeping of transformer records are available:

The service engineer shall keep and be responsible for a perpetual record of transformers in stock. This record is to be kept in the general superintendent's office, where it may be used for reference, and shall include all available transformers both in the stock room and in the transformer room. The transformers shall be listed according to class and capacity and in such a manner as to show how many are new and how many have been previously used. The service engineer shall also be responsible for the accurate upkeep of all other transformer records except the chart files (shown in Fig. 1) and record of installations and removals kept in the general engineering department by the engineering assistant in charge of records.

NO. _____

MAKE _____ H. T. VOLTS _____ L. T. VOLTS _____ K. W. CAPACITY _____

MFRG'S NO. _____ TYPE _____ FORM _____ DATE PURCHASED _____

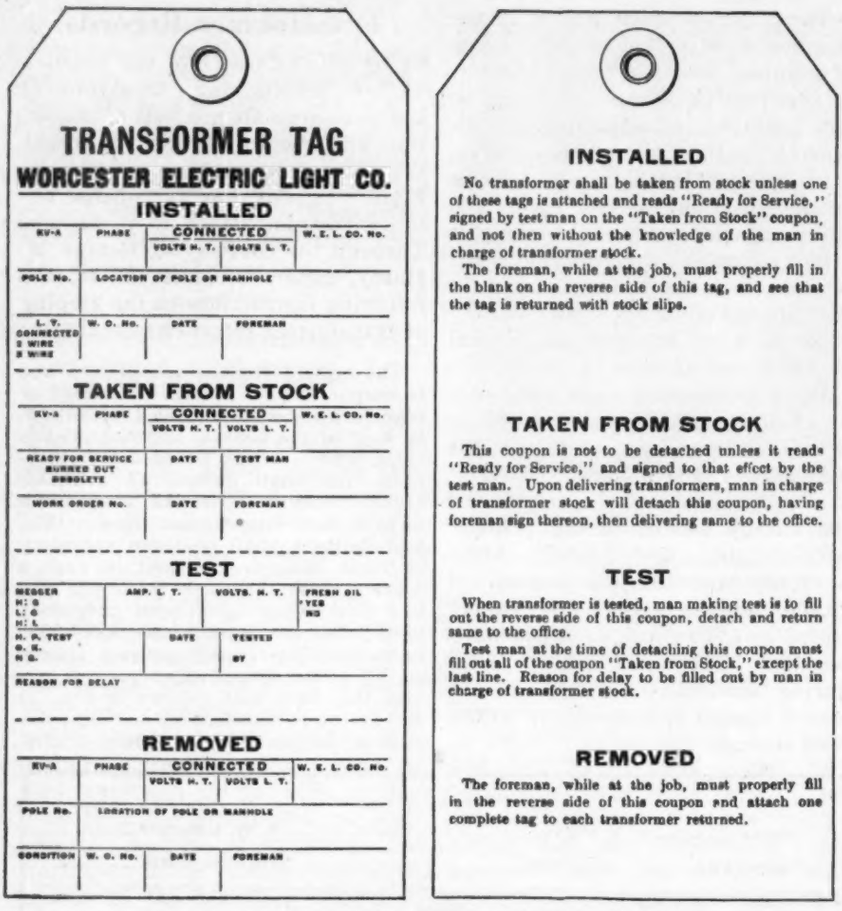
DATE INSTALLED	LOCATION

FIG. 1—TRANSFORMER RECORD CARD

A record of each transformer in service or ready for service shall be kept in the general engineering department by the engineering assistant in charge of records. The record shall consist of a card (see Fig. 1) corresponding to each transformer and bearing a complete history of that particular transformer throughout its entire period of service for the company. These cards are to be filed according to a company number, which shall appear at the top of the card and also on the case of the corresponding transformer.

The company number shall be assigned to the transformer by the transformer repair man when it is made ready for service and shall be determined by the following arbitrary method whereby the class of transformer becomes evident if its number is known, numbers preceded by zero being used to indicate special voltage:

No.	Phase	Volts		Type
From 1—4,000	Single	2,200	110/220	Overhead
4,001—5,000	Single	4,400	110/220	Overhead
5,001—5,200	Single	2,200	608	Overhead
5,201—5,700	Single	2,200	110/220	Subway
5,701—6,000	Single	2,200	608	Overhead
6,001—6,200	Single	2,200	608	Subway
6,201—6,300	Three	2,200	220	Overhead
6,301—7,000	Three	2,200	608	Overhead
7,001—7,100	Three	2,200	220	Subway
7,101—7,500	Three	2,200	608	Subway



TRANSFORMER TAG

WORCESTER ELECTRIC LIGHT CO.

INSTALLED

KV-A	PHASE	CONNECTED VOLTS H. T.	CONNECTED VOLTS L. T.	W. E. L. CO. NO.
POLE NO.	LOCATION OF POLE OR MANHOLE			
L. T. CONNECTED 2 WIRE 3 WIRE	W. O. NO.	DATE	FOREMAN	

TAKEN FROM STOCK

KV-A	PHASE	CONNECTED VOLTS H. T.	CONNECTED VOLTS L. T.	W. E. L. CO. NO.
READY FOR SERVICE BURNED OUT OBSOLETE		DATE	TEST MAN	
WORK ORDER NO.		DATE	FOREMAN	

TEST

MEGGER H: G L: G H: L	AMP. L. T.	VOLTS. H. T.	FRESH OIL YES NO
H. P. TEST O. K. N. G.		DATE	TESTED BY
REASON FOR DELAY			

REMOVED

KV-A	PHASE	CONNECTED VOLTS H. T.	CONNECTED VOLTS L. T.	W. E. L. CO. NO.
POLE NO.	LOCATION OF POLE OR MANHOLE			
CONDITION	W. O. NO.	DATE	FOREMAN	

INSTALLED

No transformer shall be taken from stock unless one of these tags is attached and reads "Ready for Service," signed by test man on the "Taken from Stock" coupon, and not then without the knowledge of the man in charge of transformer stock.

The foreman, while at the job, must properly fill in the blank on the reverse side of this tag, and see that the tag is returned with stock slips.

TAKEN FROM STOCK

This coupon is not to be detached unless it reads "Ready for Service," and signed to that effect by the test man. Upon delivering transformers, man in charge of transformer stock will detach this coupon, having foreman sign thereon, then delivering same to the office.

TEST

When transformer is tested, man making test is to fill out the reverse side of this coupon, detach and return same to the office.

Test man at the time of detaching this coupon must fill out all of the coupon "Taken from Stock," except the last line. Reason for delay to be filled out by man in charge of transformer stock.

REMOVED

The foreman, while at the job, must properly fill in the reverse side of this coupon and attach one complete tag to each transformer returned.

FIG. 2—TRANSFORMER TAG USED BY WORCESTER COMPANY

When a new transformer is taken from stock, the transformer repair man shall enter under the proper classification in a transformer book kept by the service engineer the manufacturer's serial number, primary and secondary voltages, kva. type, form and date. He shall also assign and enter a company number, which shall be one greater than the last number used in that class. The transformer repair man shall then stamp this number on the lower right-hand corner of the transformer manufacturer's name plate and also stencil the number on the front of the case with aluminum paint. He shall then affix a tag of the type shown in Fig. 2 to the transformer and mark it "Ready for service."

When a line foreman takes a transformer out of the transformer room, he must fill out the last line of the "Taken from stock" portion of the tag, which shall then be detached by the transformer repair man, or in his absence by the line foreman, and put in the box provided for the purpose. The transformer repair man shall decide which transformer is to be taken. When installing a transformer in the field, the line foreman shall fill out the "Installed" portion of the tag and turn it in to the general line foreman. If the transformer is installed to replace another one, or in any case where a transformer is removed from service, the line foreman shall also fill out the "Removed" portion of a new tag with the number, size and fault of the removed transformer, and attach the complete tag to that transformer before returning it to the transformer room.

The transformer repair man shall, upon receiving a returned transformer, tear off the "Removed" portion of the tag and deposit it in a box provided for the purpose in the transformer room. After testing the transformer he shall fill out and deposit in the same box that portion of the tag headed "Test." At the same time he shall fill out all but the last line of the "Taken from stock" portion of the tag, leaving it attached to the transformer until the line foreman who is to install the transformer in its next location fills out the last line. The "Taken from stock" portion shall then be deposited in the same box as mentioned above. The transformer repair man shall deliver the contents of this box daily to the service engineer.

The service engineer shall send all tags or portions of tags to the engineering assistant in charge of records. He shall also send written notice to the same engineering assistant in case any transformer is sold, loaned or junked. The general line foreman shall send all "Installed" portions of tags to the engineering assistant in charge of records.

The engineering assistant in charge of records upon obtaining one or more sections of the transformer tag, together with stock report, shall enter in a loose-leaf book provided for the purpose the date, company number, type, kva., voltage, phase, whether installed or removed, location and initials of the foreman who did the work. He shall also enter on a transformer record card (Fig. 1) the items called for by the card. The serial number shall be obtained from the transformer book which is kept by the service engineer. Other information shall be taken from the stock repair report, work order and transformer tag. If a removal, the words "Returned to stock" shall be entered, with date. The card shall then be filed according to company number.

The transformer tag and stock report shall then be given to the engineering assistant in charge of poles, who shall put the transformer on the corresponding plate map and send the corresponding pole card and the transformer tag to the directory clerk in the service department.

The directory clerk shall enter the transformer on the pole card, also add to this record a new "transformer load" card, or in case of an old transformer transfer the information from the tag to the corresponding transformer load card already in the file.

Test for Watertightness of Transformers

BY C. B. HEFNER
Superintendent of Distribution Dallas (Tex.) Power & Light Company

ELECTRICAL apparatus which is satisfactory in every other way many times fails because it is not watertight. This has been found particularly true of outdoor transformers and subway junction boxes by the Dallas Power & Light Company. Consequently, the installation crew is always required to test such apparatus immediately after installation and before it is put in service for its ability to resist the entrance of moisture and water.

To conduct this test the installation crew is required to carry with it a duplex bicycle pump and a pressure gage which reads up to 6 lb. This gage is connected between the casing to be tested for leakage and the pump, a check valve being inserted beween it and the pump to prevent leakage of air back through the pump itself. The tube from the pump is equipped with a fitting which can be screwed into the plugs that are usually provided on transformers and junction boxes. All transformers and junction boxes which are not so equipped are provided with a plug so that the test may be made. Soapsuds are smeared over all joints in the casing which might possibly leak, and the pressure within the case is raised to 6 lb. The gage is left connected for ten minutes. If the pressure drops one-half pound in this time, search is made for the leak, which is then sealed.

Central Station Business

Utility Buildings Harmonized with Surroundings

THE beneficial effect on public relations of making utility buildings harmonize with, or even improve the appearance of, their surroundings is becoming more and more recognized. A recent example of this tendency is afforded in the district office building of the Detroit Edison Company at Mount Clemens, Mich., a town of some fifteen thousand inhabitants. The building is of attractive appearance and has attracted favorable newspaper and personal comments on this account. Still, the company reports that the cost of the building was not increased by giving special attention to its exterior design, the district manager, R. F. Hotton, reporting that it was built at a cost much less than the general run of such buildings.

The building is a two-story brick-and-tile structure, situated in the fringe of the business section and serving as headquarters for the company's St. Clair district, which embraces eighteen towns and cities. On one side of the main floor is the service department and on the opposite side is the sales department. At the rear are the manager's office, reception, consultation and rest rooms. In the basement is the storage department, on the first floor the meter department, and on the second floor are the bookkeeping department, billing room and overhead-lines departments.

The finish of the interior is in natural oak with the exception of the business office, manager's office and consultation room, which are in natural walnut. The counter and cashier's cage are in walnut finish with marble bases. The floors of the business offices are of terrazzo and cork tile. The lighting equipment was laid out by the company's engineers.

New Orleans Inaugurates Customer Ownership

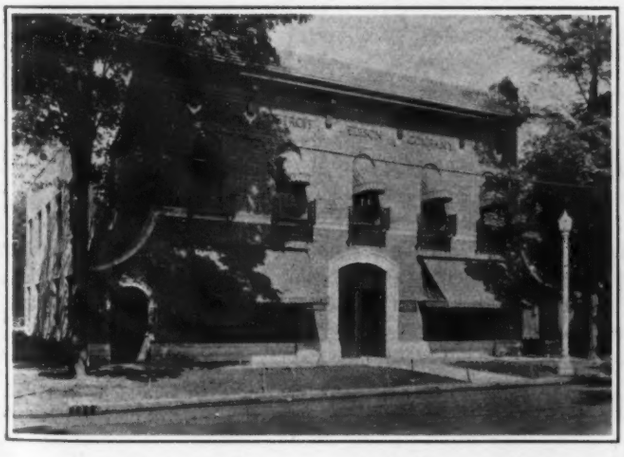
FOLLOWING a successful campaign of only two weeks' duration, in which 3,200 out of 3,400, or 94½ per cent, of the permanent employees of the New Orleans Public Service, Inc., purchased shares of the company's cumulative preferred stock, the company has announced that shares of the same stock, in either large or small amounts, can now be purchased by customers of the company or others in the community. Dividends are paid upon this stock every three months, and it is being offered on a liberal partial-payment plan, under which shares can be bought for as little as $10 a month.

"In adopting this plan of customer ownership," said H. B. Flowers, president of the New Orleans Public Service, "the company is following its policy of establishing closer relationship with its customers, employees and other citizens. The management believes that the dividends on this stock should be distributed among those who support the company and those who operate it."

Hartford Electric Truck Service Plan

ELECTRIC trucks operated on the battery-exchange service plan at Hartford, Conn., have covered about six million miles of service in the twelve years that this system has been available, according to W. M. Thayer, president of the Electric Transportation Company. Ninety-two electric trucks are at present in operation at Hartford, their July mileage being 35,696, compared with 35,307 in the same month last year. A year ago the American Railway Express Company had but one electric truck in this city, but since last May it has added thirteen, twelve of which are 2-ton units. The New Haven Dairy Company now operates five 3.5-ton electrics in this community, and the local coal industry is a large user.

The rates have been somewhat simplified this year by the abolition of steps in the schedule of cents per mile used by the company, this unit charge now running from 4 cents per mile for 750 and 1,000-lb. trucks up to 15 cents per mile for 5-ton trucks. The former ampere-hour adjustment continues, with the



EXTERIOR AND INTERIOR OF THE FIRST FLOOR OF THE DETROIT EDISON NEW DISTRICT OFFICE, MOUNT CLEMENS, MICH.

RATES PER MONTH FOR FULL SERVICE AND MODIFIED* SERVICE ON ELECTRIC TRUCSK

	750-Lb.		1,000-Lb.		1-Ton	
	Full	Modified	Full	Modified	Full	Modified
Fixed charge	$39.16	$39.16	$39.16	$39.16	$47.50	$47.50
Mileage charge	0.04	0.02	0.04	0.02	0.06	0.03
	2-Ton		3½-Ton		5-Ton	
	Full	Modified	Full	Modified	Full	Modified
Fixed charge	$55.83	$55.83	$64.16	$64.16	$72.50	$72.50
Mileage charge	0.09	0.04	0.13	0.05	0.15	0.06

* Modified service differs from full service in that with the former the customer charges his battery on his own premises. The allowed amperes per mile are the same for each class of service.

previous space rates and charges for greasing and washing service.

A new or modified service rate has lately been put in force to permit battery charging on the battery customer's premises. The fixed charge is the same as before. The customer pays the Hartford Electric Light Company for power used and allowance for this is made in a lower mileage rate. This allowance is considered ample for power at a 3-cent rate, but this is not a guaranteed item. Under this plan the customer owns the truck equipped for quick exchange, without battery and the wiring on his premises for the charger. The Electric Transportation Company furnishes the battery and charger and assumes maintenance of battery, charger, odometer and Sangamo meter.

The company stands ready to exchange the battery at its garage on three days' notice because of low capacity or for the purpose of testing and repairing a battery. Should a charger on customer's premises fail, the customer brings his truck to the company's garage for charging and pays for energy used in this emergency charging, but not for space or use of charging equipment.

The company makes a monthly inspection of truck, battery and charger with written report. The customer brings his truck to the company's garage once each week on a prearranged day and hour convenient to both for filling and checking the battery. The customer furnishes a man to put a truck on charge and is bound by the rules for operating chargers and charging a battery as given by the company. The customer may take advantage of parts stock carried by the Electric Transportation Company for repairs to his truck to be made by his men or by the company.

The plan is offered on the basis of three-year contracts and the rate per month for full or modified service are shown above.

The customer may cancel the contract at any time on written notice by purchasing the battery at list price less depreciation on a basis of three-year life, and the charger at list price less 10 per cent depreciation per year.

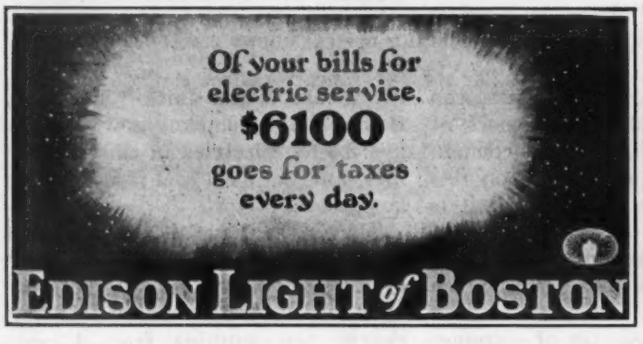
Five-Year Growth of the Electric Heating Business

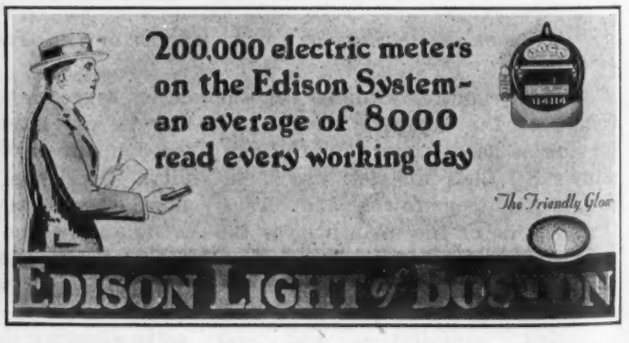
HOW important the industrial electric heating load is becoming to the central-station industry is well illustrated in the tabulation below, prepared by the industrial heating committee of the N. E. L. A. and presented at the recent Boston convention of the American Society for Steel Treating. Within the last five years eighteen manufacturers of industrial electric heating equipment have sold 830,000 kw. in capacity of this type of apparatus. It is interesting to note from the table that industrial ovens and small miscellaneous apparatus, both of which are probably the most desirable and diversified loads of this class, constitute the two largest aggregate sales on a kilowatt capacity basis. While some of this equipment is being operated on energy generated in isolated plants, it is safe to assume that more than 75 per cent is connected to the lines of central-station companies.

KILOWATT CAPACITY OF INDUSTRIAL HEATING APPARATUS SOLD IN PAST FIVE YEARS BY EIGHTEEN MANUFACTURERS

Year	Heat-Treating Furnaces	Commercial Cooking Equipment	Melting Furnaces—Brass	Melting Furnaces—Steel	Industrial Ovens	Miscellaneous	Welders	Total
1919	6,770	20,000	13,950	19,935	50,450	44,100	6,000	161,205
1920	13,050	19,150	17,050	18,020	33,450	66,100	17,000	183,820
1921	10,218	12,000	14,455	21,500	23,450	41,600	8,000	131,423
1922	15,161	15,300	19,275	26,330	27,450	56,600	10,000	170,116
1923	20,202	18,500	23,435	15,723	26,460	66,500	13,000	183,820
Total	65,401	85,150	88,165	101,508	161,260	274,900	54,000	830,384

Explaining the Central-Station Company's Daily Stint





AN EFFECTIVE means of impressing upon the public mind some conception of the volume of work and expense entailed every day in supplying electric light and power service is being used by the Edison Electric Illuminating Company of Boston. A series of street-car advertising cards similar to the two illustrated here have been prepared and each card is being displayed for one month. A card carries a brief explanation showing, as in the above, that $6,100 in taxes must be paid or that 8,000 meters must be read every day. Other cards of the series show the number of lamps renewed, tons of coal consumed, bills made out and so on, all of which serves to give the public a clearer insight into the problems which the company has to face each day in maintaining service.

VIEWS SHOWING ARRANGEMENT OF ILLINOIS POWER & LIGHT CORPORATION'S APPLIANCE STORE AT OTTAWA, ILL.

Appliance Salesroom Fitted and Stocked for $5,000

A COMPLETELY furnished and stocked retail appliance store designed with the view of standardizing the layout for others that may be remodeled or built in the future was recently opened in Ottawa, Ill., by the Illinois Power & Light Corporation. It is equipped with what the company considers the latest and best ideas in window and showcase lighting, and the total cost with an adequate stock of merchandise was well under $5,000.

The windows are fitted with twenty-six No. 600 X-ray reflectors, thirteen to each window. In addition there is an "elexit" outlet in the center of the ceiling in each window. The reflectors are spaced one foot apart and connected on two circuits in each window, controlled by switches near these windows. One circuit of reflectors is equipped to use color screens. Over the two windows and door are two floodlamps and one spotlamp for illuminating the store at night, also equipped with screens for color effects when desired.

The windows have valances of Paulist cloth, on which the company's symbol is worked in colors. About 20 in. from the floor deck and in the corner nearest the street has been reproduced the company's signature. This eliminates large letters on front windows that would hide the displays.

The show, wall and lamp cases are equipped with X-ray reflectors that light them so that the articles displayed can be seen from the street at night. The lamp case was designed with a canopy which conceals the reflectors and still permits them to light up the lamp display. This case is lighted during the day as well as evenings.

Every five feet along the baseboard of the store is a receptacle for attaching appliances. Every ten feet at a height of 7 ft. a wall outlet is installed over a small shelf for displaying fans in the summer and boudoir lamps in the winter. These shelves effectively break up the bare appearance of the walls.

Just inside the door is a "cozy corner" furnished with a 6-ft. x 9-ft. rug, a wicker settee, rocking chairs and table for the comfort of customers. Everything in the shop except the cashier's cage and counter is movable.

The total cost of the equipment of this new store was $2,616.51, itemized as follows:

Trojan glassware and Miller fixtures	$39.84
Corrugated rubber matting	71.40
Valances and floor covering for windows	76.77
Material for outlets in baseboard and wall	23.00
Reflectors and floodlamps	260.00
Wall cases, counter and show cases	1,224.00
Wall brackets (ten)	32.00
Rug, 6 ft. x 9 ft.	65.00
Wicker table	23.50
Wicker chair	21.00
Wicker settee	35.00
Linoleum for office floor	205.00
Window paneling	366.00
Signatures on windows	30.00
Electric sign	144.00
Total	$2,616.51

An inventory of the merchandise carried in stock on August 1, 1924, showed a total of $2,249.12. This is considered a fair average investment in appliances and supplies and was made up of the following articles:

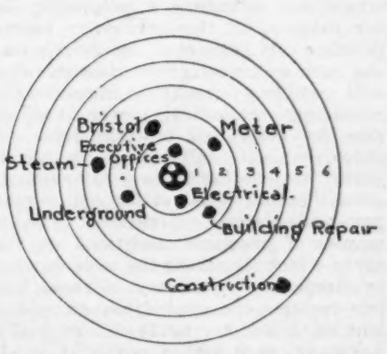
Washers	$370.80
Ironers	104.00
Cleaners	150.00
Lamp bulbs	764.22
Table, floor and boudoir lamps	73.43
Heating devices	190.66
Fans	444.95
Fuses	45.00
Irons	106.06
Total	$2,249.12

The combined cost of equipping the salesroom and investment in stock of merchandise was $4,865.63.

Walter Hahn is new business manager at Ottawa, and John S. Andrews is sales supervisor of the Illinois Power & Light Corporation.

Hitting the Bull's-Eye on the Accident Target

AN EFFECTIVE method of plotting accident records for monthly interdepartmental comparisons used by the Narragansett Electric Lighting Company, Providence, R. I., is illustrated herewith. A "no accident" report is designated by a dot in the center of a large target, and the surrounding zones are numbered from inside outward, so that a department with a greater number of



BULL'S-EYE DOTS SHOW NO ACCIDENTS FOR A MONTH

accidents is recorded by a dot farther away from the bull's-eye than is a more fortunate group of workers. In the chart reproduced the construction department, as might perhaps be expected, led the company in the number of accidents from July 10 to August 10, while three departments, the storehouse, street-lighting and office, attained a no-accident record.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Corrosion of Water Turbine Wheels.—This paper is a review of a preliminary report on this subject issued by a water power committee in Norway. It contains extensive statistical data which indicate that the deterioration of the blades is to a certain extent dependent on the suction head at the blades. The explanation for this is believed to lie in the fact that the nearly absolute vacuum under the blades produces a region of water drops mixed with free oxygen liberated by the reduction in pressure. This local vacuum under the blades may be accentuated by several factors such as the elevation of the wheel over the low water level, the velocity head of the water at the wheel and the particular construction of the wheel and the suction tunnel.—*Meddelelser fra Norske Elektricitetsverkers Forening*, August, 1924.

Cost Comparison Between Heating with Coal and with Electricity.—F. RUTGERS.—The author calls attention to the difficulty of arriving at accurate cost figures, comparing coal produced and electrically produced heat. Of basic importance for the economy of the one or the other is the so-called "operating cost equivalent," which may vary between values of one and seven. It is impossible to state in general terms how many kilowatt-hours are needed to replace 1 kg. of coal, because there are too many variable factors for every particular case, such as efficiency of the heating system, the time of operation and others. Before determining such an equivalent it is advisable to investigate whether electrical heating would not introduce a technically better solution of the particular heating problem. It is pointed out that in making such an investigation considerations will come up similar to those met in replacing mechanical power transmission by individual electric drive. In three elaborate tabulations the author gives the general factors influencing a given heating problem for coal—steam, gas and electric operation. Ten examples of practical conditions are then given which illustrate the wide variance in comparative economy of these heating systems, ranging from an equivalent of 1 kw.-hr. to 1½ kg. of coal to 1 kw.-hr. to 5 kg. of coal. It is also shown how to arrive at the maximum permissible cost of 1 kw.-hr. to make electric heating as economical as, for example, heating with coal of a certain B.t.u. and cost.—*Bulletin de l'Association Suisse des Electriciens*, August, 1924.

Brunner High-Pressure Turbine Shows Improved Economy.—Test data are given for a 2,400-kw. machine of European design, showing a consumption at full load of 18.45 lb. of steam at 202 lb. absolute, and 741 deg. F. at the throttle and exhausting at 22 lb. absolute, with a thermal efficiency of 82 per cent. The design of a unit for 1,500 lb. is shown.—*Power*, September 23, 1924.

Heat Losses Through Insulating Materials.—R. H. HEILMAN.—With the higher temperatures due to the use of superheated steam in power plants, the problem of providing suitable pipe and boiler insulation is becoming a difficult one. The present paper is therefore timely in that it includes the results of numerous and exhaustive tests on commercial pipe coverings and insulating cements, which are presented in curves, tables and formulas that can be readily used by the engineer. Interesting experimental methods are described, and the exact character of thermal conductivity and its relation to temperature gradients and differences is discussed from a physical and mathematical standpoint.—*Mechanical Engineering*, October, 1924.

Generation, Control, Switching and Protection Switching

Large High-Speed Turbo-Generators.—H. RICKLI.—As an example of the development in high-speed turbo-generators the author describes in this paper the details of several 15,600-kva., 50-cycle, three-phase generators of 3,000 r.p.m., built for the city of London by a Swiss concern. The rotor construction was the most difficult part of the design problem. Shaft and rotor body are being forged from one solid piece of highly refined chromium-nickel steel, the slots for the excitation winding being machined out of the solid material. To reduce mechanical forces upon the winding, aluminum ribbon has been selected in preference to copper. The higher heat losses of aluminum are compensated by very excellent ventilation, maintained by two fans, one on each side of the rotor. The difficulty of making reliable joints in the aluminum ribbon has been successfully overcome by a special autogenous welding process, which gives easily made and absolutely dependable joints. Test methods are described, by means of which the volume and the temperature of the cooling air, blown through the rotor, have been measured. The former was done with anemometers, the latter with a number of thermo-couples in series. Segregated losses, efficiencies and heating are given in a number of curves.—*Bulletin de l'Association Suisse des Electriciens*, August, 1924.

Sludging Test for Transformer Oils.—W. H. NUTTALL.—The method described depends on a difference of interfacial tension between oil and water or sulphuric acid, according to the proportion of unsaturated hydrocarbons present, to which sludge formation is believed to be due. The interfacial tension is determined by allowing a definite volume of acid to flow into the oil from a pipette and counting the number of drops produced. For oils having a sludge value below 0.08 per cent this tension ranged between 48 and 55 dynes per centimeter, while for lower grade oils, having sludge values above 0.7 per cent, it fell to from 20 to 27 dynes per centimeter. The computation is rapid, from twenty-five to fifty minutes per sample. The author believes the figures establish a connection and that the method should receive consideration.—*World Power*, August, 1924.

Transmission, Substations, and Distribution

Hyperbolic Method of Transmission-Line Solution.—H. WADDICOR.—Equations are stated and a numerical example is worked out for a line of specified physical dimensions, to show the method. The exact values of the auxiliary constants are compared with those found by various commonly used approximations.—*World Power*, August, 1924.

Standardization of Fuse Boxes for Residence Installations.—Report of a committee under the N. E. V. F. (Society of Norwegian Power Stations) covering the development of standard types of fuse boxes for this purpose.—*Meddelelser fra Norske Elektricitetsverkers Forening*, September, 1924.

Use of Relays for the Ground Current in Three-Phase Systems with Grounded Neutral.—S. NORBERG.—The complete theory for the conditions in this type of relays is rather complicated. The author arrives at a few useful relations by making certain reasonable approximations. The most important of his conclusions are: (1) The performance of the relay depends upon the energy consumption of the relay, the no-load reactance of the current transformers and the magnitude of the ground current. (2) If the energy consumption of the relay and the no-load reactance of the current transformers are given, the ground current must stand in a certain relation to the line current. (3) If the magnitude of the ground current and the no-load reactance are given, it is necessary that the energy consumption of the relay be less than a certain definite value. (4) The sensitivity of the relay is increased by increasing the no-load reactance of the current transformers.—*Teknisk Tidskrift* (*Swedish*), *Elektroteknik*, September 6, 1924.

Illumination

Measurement of Candlepower by Means of the Photo-electric Cell.—F. K. MOSS.—A photo-electric cell of the potassium-hydride type, properly shielded from direct radiation, is mounted in a photometric sphere and connected in circuit with a battery, a damped galvanometer and a 50,000-ohm resistance. The cell is for all practical purposes instantaneous, is so sensitive that a change of less than one-tenth of 1 per cent in candlepower can be detected, gives responses proportional to the incident radiation and gives readings that can be closely duplicated. Since the sensitivity curve does not coincide with that of the eye, it is necessary to apply corrections when the efficiency of the test lamp differs from that of the standard. The

author discusses methods by which results in substantial agreement with visual measurements can be secured.—*General Electric Review*, September, 1924.

Motors and Control

Rehabilitation of Steel Mills.—J. M. MOORE and H. M. MCLAIN.—The recent radical changes in working conditions have made necessary a considerable increase in the number of men employed in steel mills, often justifying extensive changes in equipment and operating methods. The economic considerations which will govern the extent of rehabilitation in a given case are discussed.—*Electric Journal*, September, 1924.

Temperature Rise of Stationary Electrical Apparatus as Influenced by Radiation, Convection and Altitude.—V. M. MONTSINGER and W. H. COONEY.—The influence of radiation, convection and altitude on the temperature rise of stationary electrical machinery are discussed. The division of losses by radiation and convection from tall vertical planes is determined, and then the division of losses from a black plane, and based upon this division a simple formula is developed for determining the ratio of losses for an irregular surface where the greater part of the loss is by convection. The effect of various colors on the temperature rise of transformers and corrugated tanks is considered.—*Journal of A. I. E. E.*, September, 1924.

First Complete Electrification of an Open-Pit Iron-Ore Mine in Minnesota.—R. S. WALKER.—After a historical review of the discovery of ore in northern Michigan and Minnesota, the author points out that the geology of the central Mesabi deposit makes open-pit mining very economical. At the Wabigon mine the stripping and loading of ore is handled by a 350-ton shovel and clean-up cuts by one of 60 tons, each receiving three-phase current at 2,200 volts, 60 cycles. In the larger one Ward Leonard control is used, a 435-kva. synchronous motor driving one 250-kw. and two 50-kw. direct-current generators supplying current to two 175-hp. hoist motors, one 75-hp. swing and one 75-hp. crowd motor. The electric shovel has eliminated the labor cost of firemen and craners, reduced power cost from 2½ cents to ½ cent per cubic yard, as compared with steam, and on the basis of experience in other mines is expected to cut repairs from $25,000 to $5,000 per year. Haulage is by three 60-ton locomotives with pantograph and side-arm collectors, making contact with the 500-volt trolley-wire. The author gives specifications and operating costs in considerable detail.—*Electric Journal*, September, 1924.

Electrophysics, Electrochemistry and Batteries

Determination of Magnetization Curves by Means of the Effective Value of the Magnetizing Current.—IVAR HERLITZ.—When the form of the current wave is of importance it is frequently necessary to know the magnetization curve for the iron in question. This curve is not always available, however, while the relation between the effective value of magnetizing alternating current and a maximum induction of a known curve form is relatively easy to obtain. The author gives a method for calculating the real magnetization curve from this information. The root-mean-square value I of the current is known and expresssed as a known function of the maximum value of the induction B. The instantaneous value of B is now expressed as a simple function of the time; this function should adhere as closely as possible to the sine form, but is made up of straight lines in order to form an algebraic function of the time. dI/dB can then be expressed as a function of the maximum value of the current, the constants of the assumed induction curve and B. Since dI/dB can also be determined from the known BI curve, it is evident that there will remain a relation between the maximum value of the current, the constants of the assumed curve and the maximum instantaneous value of the induction. Naturally this relation is correct only as far as the assumed induction curve agrees with the actual and under the assumption that the hysteresis effect can be neglected. The results agree very well with tests, however.—*Teknisk Tidskrift (Sweden), Elektroteknik*, Sept. 6, 1924.

Rectifier Wave Forms.—D. C. PRINCE.—The events in rectifier circuits of various numbers of phases are traced. Tables are given for computing the inductance required for smoothing out the secondary current to any desired degree. The resulting square blocks of current, however, cause more heating in the transformer, thus materially reducing the permissible output below that obtainable without rectification. Inductance in the transformer itself produces or may produce a transient condition equivalent to a short circuit for a fraction of each cycle. The analogy to the phenomena of commutation in a direct-current machine is pointed out.—*General Electric Review*, September, 1924.

Telegraphy, Telephony, Radio and Signals

High-Frequency Alternators.—C. M. LAFOON.—Stator and rotor design data, characteristic curves including saturation, core loss, voltage frequency and voltage time, and reasons for their departure in form from those of low-frequency machines, for two cylindrical inductor-type high-frequency generators, one rated at 50 kw., 125 volts, 30,000 cycles and 6,825 r.p.m., the other at 100 kw., 250 volts, 6,500 cycles and 4,875 r.p.m.—*Electric Journal*, September, 1924.

Reproduction in Radio-Telephony.—L. C. POCOCK.—An attempt has been made first to define terms suitable to the scientific study of faithful reproduction, second to analyze into separate constituents the types of distortion occurring, and third to lay down the general principles above referred to and give them as far as possible a mathematical form. This has been done not only for the purpose of insuring precision and definiteness of statement, but also to enable quantitative application to be made and to prepare a foundation on which to build as knowledge of the subject progresses. Special consideration has been given to transient phenomena because in much of the apparatus used for radio telephony the ordinary forms of steady-state distortion can be reduced to a negligible amount. The principal types employed in radio telephony have been considered in as general a way as possible. A bibliography has been attached, where detailed investigations will be found.—*Journal of the Institution of Electrical Engineers*, September, 1924.

Miscellaneous

Outstanding Developments on Electrical Machinery in Europe.—K. SACHS and P. FABER.—The highest unit turbo-generator output has been raised to 25,000 kva. at a speed of 3,000 r.p.m., this being made possible with the development of a very high-grade steel. The record capacity of waterwheel generators stands now at 30,000 kva., representing the largest European machines. A number of small and medium vertical-shaft waterwheel sets for low-head developments have been built, having a helical gear interposed between turbine and generator. Generator voltages for capacities over 10,000 kva. of 15 kv. are standard, with a few machines of 17.6 kv. On single-phase railway generators, operating with one pole grounded and calling for three times normal voltage test, special metallic ground sleeves are being provided at the coil ends near the stator iron. A noteworthy development is a very simple and reliable centrifugal rotor short-circuiting switch used on small three-phase motors. Great advances can be recorded in the development of very large three-phase motors with economical speed regulation within wide limits. Automatic substations, containing only a few relays, have proved very satisfactory and gain in popularity. There seems to be a growing tendency to build large power transformers as self-cooled units, for which design a radiator tank is being used. Ratio adjusters and water-flow indicators are among the newest accessories to transformers. The general use of large-capacity mercury-arc rectifiers is growing rapidly. Several designs of high-vacuum pumps are described. An interesting trip-coil construction for oil switches has been developed which requires only one coil for both the overload and the no-voltage trip. A large part of the paper (sixteen pages) is devoted to the latest developments in steam turbines, containing forty sectional drawings and illustrations.—*Brown-Boveri Mitteilungen*, August, 1924.

Statistical Information from the Norwegian Electrical Industry.—This booklet is edited by Norske Elektricitetsverkers Forening (Society of Norwegian Power Stations) and contains complete lists of the various power stations in Norway, giving particular information of the station equipments, the distribution nets, the distribution of the load, rates, etc.—*Meddelelser fra Norske Elektricitetsverkers Forening*, September, 1924.

Scientific and Industrial Research

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

Research Completed

Ball Bearings of Stainless Steel

Ball bearings are ordinarily made of steel containing about 1 per cent carbon and 1.5 per cent chromium and hardened to 650 to 700 Brinell. After the discovery of stainless steel ball-bearing manufacturers naturally turned to it in the hope of finding the solution of the problem of rust-resisting ball bearings. The use of bronze ball bearings for this purpose, because of their comparative softness, has been rather limited. A series of tests of stainless steel as a ball-bearing material has been conducted during the past six years, but the results are far from promising. The carrying capacity of the stainless steel bearings tested was from 10 to 20 per cent of that of ordinary ball bearings. These steels, therefore, are much inferior in their carrying capacity and are only slightly superior to the bearings made of bronze.—*Axel Hultgren, Aktiebolaget Svenska Kullagerfabriken, Gothenburg, Sweden.*

Generators, Electric, Fire Protection of

Experiments were recently conducted on a 45,000-kva. vertical generator to determine if carbon dioxide gas could be successfully applied for extinguishing electrical fires in such machines. It has been proved that 10 per cent of CO_2 in air will not support combustion, although for practical purposes a higher percentage is advisable as a safety factor. For details see Hydro-Electric Power Commission of Ontario *Bulletin*, 1924, page 224.—*C. B. Stephens, Toronto, Canada.*

Glassware, Tests on

Tests have revealed the superior qualities of some new types of glass that are made into inclosing globes. These newer glasses produce practically perfect diffusion with a surprisingly high efficiency and without excessive weight.—*Hydro-Electric Power Commission, Toronto, Canada.*

Lamp, Incandescent, for Focusing Purposes

It is difficult to produce small incandescent lamps, such as are used for automobile headlights, so as to have an exactly constant distance between the filament and the base. A small difference in this distance means refocusing the projector every time a lamp is replaced. A French inventor (Marsat) has developed a compound base, consisting of a cylinder and a sphere, by means of which the correct distance between the filament and the base is readily obtained during the process of manufacture of the lamp. For details see *Recherches et Inventions*, June 15, 1924, page 592.

Photometer, Binocular

In the field there is a piece of ordinary looking glass from which the backing has been removed and a pattern of fine and wide scratches made in the silver. The wide scratches disappear with equality of both color and intensity, but only the finer scratches disappear when there is a color difference. The binocular feature is useful in doing routine work over long periods of time without fatigue. It is also possible to watch the outer field of the wide scratches for color differences and at the same time to obtain a photometric balance by watching the disappearance of the fine scratches in the center. For details see *Transactions, Illuminating Engineering Society*, July, 1924, page 508.—*H. P. Gage, Corning, N. Y.*

Radio, Regeneration by Inductive Feedback

One method of regeneration is the feeding back of alternating power, by inductively coupled coils in the two circuits, from the plate circuit to the tuned circuit connected to the grid of the electron tube. This method has been used extensively in modern radio receiving sets and is known as the "tickler" method of regeneration. By means of simple alternating-current theory an equation has been derived from which the amplification produced by inductive feedback may be calculated. The equation was completely verified by experiments, described in Bureau of Standards "Scientific Paper No. 487."—*C. B. Jolliffe and Miss J. A. Rodman, Bureau of Standards, Washington, D. C.*

Ultra-Violet Light, Effect of, on Polished Metal Surfaces

If ultra-violet rays are shielded from most of the surface of a polished specimen and allowed to play upon a small area, a pronounced change results in the exposed area. Specimens of "Armco" iron, medium-carbon steel, "stainless" and high-nickel steels were exposed for eighteen hours to the rays. When the specimen is cooled and the moisture of the breath allowed to condense on the surface, the exposed area becomes visible at once. It follows from the above that the action of the ultra-violet rays plays a part in the surface change of metals.—*Bureau of Standards, Washington, D. C.*

In Progress or Purposed

Coal, Transformation of, Into Liquid Fuel

Extensive research is being done along the following lines: (a) Distillation at a low temperature, resulting in liquid compounds and in semi-coke; (b) utilization of semi-coke for the production of water gas; (c) transformation of water gas into a liquid fuel by passing it at a high pressure over a catalyzer. Actually, beginning with 3,000 calories, about 1,000 are recovered in the liquid. The investigation is mainly published in the periodical called *Brennstoff Chemie.—Kaiser Wilhelm Institut für Kohlenforschung, Mulheim (Ruhr), Germany.*

[For similar work done in America see "Distillation Products of Coal," a technical report of the National Electric Light Association, April, 1924.—EDITOR.]

Dielectrics, Power Loss and Ionization in

A research is being conducted on the subject of dielectric loss and ionization. The preliminary work involved study of the several possible methods of making measurements, the selection of the most suitable method for the purpose and then securing and setting up the apparatus. Tests are now in progress on various types of insulation for the purpose of indicating the lines on which the research should be conducted. It is proposed to utilize two independent methods of making the tests, one as a check on the other.—*Harvard Engineering School, Cambridge, Mass.*

Illumination, Study of, on Models

Many illumination problems can be studied with the aid of models. For example, a factory room was built to scale using "RLM" reflectors with bowl-frosted lamps and showing windows and machines. The "RLM" reflectors were cut from 2-in. wooden blocks, and automobile tail-lamps were used as light sources. Three different combinations of ceiling and walls were available. The model room was inverted in order that the photometer test plate might be inserted through holes bored in the floor. In this way the illumination in the model room was studied at a minimum of cost. The resultant illumination was a very fair approximation of the illumination which was actually produced in the room corresponding to the model.—*W. F. Little, Electrical Testing Laboratories, New York City.*

Radio, Interference of Power Circuits with

Because of an increasing number of complaints about noises caused by power circuits which interfered seriously with broadcasted programs, a sub-committee has been appointed for the following purposes: (a) to serve as a clearing house of information on the subject, (b) to conduct or supervise experimental work upon the location of sources of interference, (c) to furnish the necessary information to the public.—*Inductive Co-ordination Committee of the N. E. L. A.*

Vehicles, Electric Service Tests on

During the month of September tests will be made on various electric trucks, from 0.5 ton to 6 tons, to determine, (a) energy consumption, (b) energy necessary for charging the batteries, (c) feasible commercial speeds. The following French organizations have agreed to co-operate in the organization and supervision of these tests: Ministry of War, National Office of Scientific and Industrial Researches and Inventions, the Automobile Club and the Central Electric Laboratories.—L'Union des Syndicats de l'Electricité, Boulevard Malesherbes, 25, Paris, France. [The above union of electrical syndicates corresponds to our National Electric Light Association.—EDITOR.]

Suggestions for Research

Cables, High-Tension, Effect of Mechanical Stress on Insulation

The considerable mechanical pull required to draw a cable into a duct may possibly weaken the insulation electrically. The same is true in regard to bending. An opinion has been expressed that the reported superior performance of high-tension cables abroad may be due to gentler methods of installation in vogue in foreign plants.

Electroscope, Battery Substitute for Work with

For charging an electroscope a high-potential battery is often employed to eliminate the dangers to the leaf. A static condenser as a simpler source of voltage suggests itself, and some preliminary work in this direction has been done by E. L. Harrington.—*Journal of Optical Society of America*, 1924, Vol. 9, page 185.

Nickel-Chrome Spectroscope

An instrument has been developed by Adam Hilger, Ltd., of London (N. W. 1) England, which, it is assumed, enables one to discriminate between such steels as, for instance, (1) a carbon steel with from 0.20 to 0.35 per cent carbon and only traces of nickel and chromium; (2) a steel with a similar carbon content but containing also 2 or 3 per cent of nickel, and (3) a steel with a similar carbon content but containing also 0.05 to 1 per cent of chromium. An investigation is desired as to the usefulness of such an instrument in a shop or in a stockroom where many kinds of material of different composition have to be handled.

Transformers, Tap Changing Under Load

Several manufacturers have developed arrangements for changing high-voltage taps under load, and an experimental investigation is desired to determine their relative advantages and, if possible, to standardize on one method. For a description of these devices see the N. E. L. A. report of the electrical apparatus committee, No. 24-45.

X-Rays for Locating Concrete Reinforcements

An interesting possible commercial application of the X-ray was suggested in a conference with a consulting engineer, namely, that of locating steel reinforcement rods in concrete girders in buildings already constructed to avoid mutilating the structure. The practical difficulty may be that a very powerful equipment may be required to penetrate large girders.—*Bureau of Standards, Washington, D. C.*

News of the Industry

Ford Withdraws Muscle Shoals Bid

Detroit Manufacturer Announces that He Can Get All the Electrical Power He Needs Without Aid from the Tennessee River—Indorses Plan for Inquiry

USING *Collier's Weekly* as a medium, Henry Ford has announced the withdrawal of his bid for the government plants at Muscle Shoals, around which controversy has raged for the last two years. According to Mr. Ford, as quoted in an authorized interview: "Muscle Shoals is not a live issue with us any longer. More than two years ago we made the best bid we knew how to make. No definite action has been taken on it. A simple affair of business which should have been decided by any one within a week has become a complicated political affair. We are not in politics and we are in business. We do not intend to be drawn into politics."

"Does this mean, then, that you withdraw absolutely from Muscle Shoals and everything that pertains to it?" the interviewer asked.

"Yes," was the reply; "we have made our bid; now let them make us a bid, and they will not have to wait three years for an answer. We can tell them in five minutes."

Mr. Ford asserted that by recent investments in Kentucky coal lands he would be able to get all the electrical power he needs without recourse to hydro-electric sources on the Tennessee River or elsewhere. He declared himself in favor of the appointment of a commission, as suggested by the President, to investigate the whole subject of Muscle Shoals power and nitrate manufacture. His announcement, although there had been rumors that it was coming, appears to have been made without previous notice to the War Department or consultation with his supporters in Congress.

Program of National Association of Commissioners

Uniform laws for the regulating commissions, the rates and service of public utility companies, the valuation of railroads and proposed amendments to the federal transportation act of 1920 are among the subjects scheduled for discussion at the thirty-sixth annual convention of the National Association of Railroad and Utilities Commissioners, which will meet in Phoenix, Ariz., from November 11 to November 14 inclusive. It is expected that an address will be delivered by Secretary Hoover. There will also be addresses by at least one member of the Interstate Commerce Commission, by several members of the state commissions and by former presidents of the association, including Carl D. Jackson of New York City, Walter A. Shaw of Chicago and Charles E. Elmquist of St. Paul. There will also be addresses by representatives of electric, railroad, gas and telephone companies. The Corporation Commission of Arizona has arranged an elaborate program of welcome and entertainment for the convention.

Radio Monopoly Impossible

Secretary Hoover So Declares—Recommendations of the Conference at Washington

"THERE is just one cardinal principle in the attitude and the work of the Department of Commerce toward radio," declared Secretary Hoover at the third national radio conference, which concluded its sessions at Washington on Friday of last week. "We intend to encourage and develop this art in each of its phases through to its maximum service to the American people. It cannot so develop if there is any monopoly in it. With 530 stations, with three or four or five possible methods of interconnection now developing, there is no monopoly in radio today, and there never will be. I make that statement advisedly and I hope conclusively. I want it clearly understood, and I believe this conference agrees to those principles firmly."

The deliberations of the conference were summed up in a report with recommendations to Secretary Hoover. In this report the conference declared itself "unalterably opposed to any monopoly in broadcasting" and suggested that national broadcasting through interconnecting stations be extended, that the power stations be increased, and that experimentation be permitted under strict limitation to determine whether proposed superpower broadcasting stations can be operated without interfering with the existing system.

GOES SLOW ON SUPERPOWER STATIONS

On the latter point it was contended that a mistake would be made if any station superior in power to stations now in use were authorized. This subject was referred to a subcommittee, which submitted a recommendation, approved by the conference, that no superpower stations be authorized except for experimentation, and that future policy be dependent upon the outcome of the experiments, which the conference held must be conducted under strict supervision.

With regard to public broadcasting the conference reported that a new system of zoning has been worked out by which it is possible to obtain additional channels of air communication, with the net result that there will be an increase of thirty in the number of wave lengths now used by general broadcasting stations, bringing the total up to 100. All wave lengths up to 545 m. have been provided for, the conference reported. To prevent interference with broadcasting by radiotelegraphic stations, chiefly in marine communication, the conference recommended the use of the 300-m. wave length.

The Department of Commerce was advised by the conference to continue its policy of non-interference with programs sent out by broadcasting stations. Any other course, it was held, would be censorship. The conference further reported that it found that simultaneous broadcasting through interconnection of stations was deserving of encouragement, and it asked the Secretary of Commerce to appoint a continuing committee to work out necessary plans for its full accomplishment.

Captain P. P. Eckersley, chief engineer of the British Broadcasting Company, discussed briefly the condition of broadcasting in England and urged favorable consideration of the suggestion that arrangements be undertaken looking toward the reception in England and America of broadcast programs originating in either country.

Canadian Companies Aid Electrical Education at McGill

Four large Canadian companies have volunteered to provide McGill University, Montreal, with $65,000 to apply on the erection of a three-story wing to the engineering building. The Montreal Light, Heat & Power Company and the Shawinigan Water & Power Company have contributed $25,000 each, and the Northern Electric Company and the Bell Telephone Company $7,500 each. The action of these companies is a result of their desire to assist McGill in its preparations for the extension of electrical engineering training, in keeping with the most recent developments in that field, and it is anticipated that courses additional to the present ones will be instituted upon the completion of the building.

New Colorado and North Carolina Hydro Projects

The Southern Colorado Power Company has applied to the Federal Power Commission for a preliminary permit covering a proposed project on Grape Creek in Fremont and Custer Counties, Col. It is proposed to construct two reservoirs with capacities of 97,000 acre-ft. and 15,000 acre-ft. respectively. About 20,000 ft. of conduit will be required to deliver the water to two power houses. Grape Creek is a tributary of the Arkansas River.

The Central Power Company of Al-

bemarle, N. C., has applied for a preliminary permit covering a project on New River and Reddies River in Wilkes, Ashe and Alleghany Counties, N. C., and Grayson County, Va. The plan outlined in the application provides for four dams on New River and two dams on Reddies River. It is proposed to impound the floodwaters of New River and divert them from the upper reservoir into the Reddies River. Power is to be generated at each dam except the upper one on New River. Capacities have not been determined.

Buys Motor-Generator Locomotives

New York, New Haven & Hartford Railroad Adopts New System for Freight and Switching Service on Its Main Lines—Advantages of A.-C.-D.-C. Plan

THE New York, New Haven & Hartford Railroad Company, which has heretofore operated its entire electrified division with alternating-current locomotives, 11,000-volt trolley, and series-compensated motors for drive, has just ordered from the General Electric Company and the American Locomotive Company seven alternating-current-direct-current locomotives. These locomotives will operate from an alternating-current trolley, with a synchronous-motor direct-current generator set on the locomotive and with direct-current motors for actual drive. Five of them are destined for freight service and will be used on the main line between New York and New Haven. The other two are switching locomotives for use in general yard service. Whenever it is necessary to operate in double head, these locomotives will function in multiple unit with the present locomotives.

Power is collected by the usual slider pantograph trolley from the 11,000-volt overhead, 25-cycle, single-phase supply and is delivered to a main transformer installed on the locomotive cab. Trolley potential is stepped down to drive a 2,300-volt single-phase synchronous motor, directly connected to the main generator. The main generator delivering current to the traction motors is designed with a variable field, and the speed of the locomotive is regulated by field control of this generator. The traction motors are of the standard series, direct-current railway type, geared to the axles with cushion-type gears to allow a small movement of the gearing about the gear hub or center. Between the pantograph and the main transformer a time-limit, automatic oil circuit breaker is installed, and between the direct-current generator and the traction motors there are a high-speed circuit breaker and line switches.

EXCELLENT CONTROL AFFORDED

The New Haven engineers point to the excellent control characteristics of this method of operation and also to the fact that the synchronous motor has the very desirable characteristic of operating at a power factor of unity or can even be made to draw leading current under all ranges of load. This should have a beneficial effect on the trolley voltage for all load conditions and help the operation of the entire system.

Naturally, these locomotives can be made to operate also on the New York Central tracks, where 600-volt direct current is employed, these tracks being used by the New Haven railroad in some of its New York City operations.

W. S. Murray, now a consulting engineer at New York City, who was electrical engineer with the New York, New Haven & Hartford Railroad at the time of the electrification of that road, has issued a statement with reference to the purchase of the locomotives. In this he says that in 1905, when the study for the New Haven electrification started, he made an exhaustive investigation of the relative economic merits of direct-current 600-volt third-rail and alternating-current, 11,000-volt, single-phase overhead operation. At that time the higher direct-current voltages had not been developed and applied to overhead lines. With choice thus lying between the two systems mentioned, it appeared that, despite the alternating-current system's higher cost for motive-power equipment, its very much lower cost of distribution justified its use. Today there is in actual cost little economic choice between the so-called alternating-current and direct-current systems when applying the one or the other to any individual railroad electrification.

Mr. Murray points out that the advantage of the type of locomotive just ordered by the New Haven is that it takes advantage both of the economies of alternating-current distribution and of the very well-known operating qualities and economies of the direct-current motor. Emphasis is laid by him on "the necessity of future uniformity of type of power to be applied to the contact lines of railway electrification." "I recognize," Mr. Murray adds, "in this new type of electric locomotive a step which I feel sure will materially lessen the time toward such a result."

N. E. L. A. Technical Committees to Meet in St. Louis

The Hotel Statler at St. Louis will next week be the place of meeting of the committees of the Technical National Section of the N. E. L. A., according to the following schedule:

Monday, October 20.—Committees on accident prevention, electrical apparatus, inductive co-ordination, meters and prime movers.

Tuesday, October 21.—Committees on electrical apparatus, hydraulic power, inductive co-ordination, meters, prime movers, overhead systems and underground systems.

Thursday, October 23.—Committees on accident prevention, hydraulic power, overhead systems and underground systems.

The executive committee of the Technical Section will meet on Tuesday, and on Wednesday, which is otherwise unassigned, there will be a general conference of all committees at 8.15 p.m.

Raquette Storage Unneeded

Power Development in Region So Great that Project, of Questionable Legality, Was Dropped

THE withdrawal of the application to the Water Control Commission of New York State for the establishment of a Raquette River Regulating District, noted in the ELECTRICAL WORLD for October 4, page 756, has been pictured in New York City papers as a backdown on the part of the power and manufacturing companies concerned, associated with which were the three villages of Potsdam, Norwood and Massena, and a victory for their opponents, who based their campaign on the contention that the preservation of the park features of the Adirondack region was threatened by the proposed storage basins. These newspapers have ascribed to the applicants a change of heart induced by the defeat last fall of the Ferris water-power amendment to the state constitution.

Another view of the withdrawal is held in well-informed circles at Albany, where this step is attributed to the stupendous existing development by private capital of water power in the section through which the Raquette River flows. This, it is held, has obviated the need for a river regulating district, because much of the benefit that was sought has already been derived and most of the companies whose names appeared in the application for the creation of the district are among the beneficiaries. The defeat of the Ferris amendment had only a remote bearing on the withdrawal, it is said.

ONLY TWO DISTRICTS ESTABLISHED

Only two river regulating districts have yet been established under the conservation law providing for storage reservoirs. The Black River Regulating District was created on June 2, 1919. The ultimate cost of this improvement will be about $1,000,000, to be financed by bonds of the district, sold by the State Comptroller but secured by the property benefited in the regulating district without liability on the part of the state. The Hudson River Regulating District was created on August 2, 1922, and plans for furthering the improvements based on it are progressing as rapidly as legal machinery will permit. These two projects are water-storage undertakings in the first instance, and any power development from them will be merely incidental.

The Raquette River project was primarily an undertaking to generate power, with water storage as an incident. Its legal status had been called in question, the regulation of the streams having been assumed by the state as a police power in the interests of the public health and not in the interest of their commercial development. It is not apparent that the Raquette River storage promoters contemplated the sale of power outside the surrounding territory, and unless it be assumed that they did, the constitutional amendment permitting the building of transmission lines through the forest preserve did not affect their plan of operation.

Merrill Defends Power Board's Course

Provisions of Federal Water-Power Act Giving Preference to State and Municipal Projects Not Disregarded—Ratio of Public and Private Generation

POLITICAL discussion over public ownership has caused no little attention to be paid in the presidential campaign to the attitude of the Federal Power Commission toward the development of power by public agencies. This has led O. C. Merrill, the executive secretary of the commission, to issue the following statement in the hope that the basic facts of the commission's attitude may be understood:

"Since the water-power act has been in effect forty-six applications, totaling 2,827,000 hp., have been filed by states and municipalities. The only state applications came from Illinois and cover two projects. The remaining forty-four were sought by municipalities. Seventeen of these projects have been approved. Their total capacity is 411,455 hp. They are located in nine states and in the Territory of Alaska. In addition to the seventeen projects four other municipal applications are pending, which bring the aggregate up to 675,000 hp. These cover all projects likely to be developed at early dates.

"Fifteen of the applications were filed by the city of Los Angeles. They involve the installation of 1,660,000 hp. Because of the uncertainty as to the action Congress may take on legislation proposing to give the city rights on the Colorado River, Los Angeles has not been in a position to determine the exact course its municipal development will follow. If rights on the Colorado should be secured, undoubtedly some of the developments proposed on the Kern River and in Owens Valley would not be necessary. In view of that situation, the commission has allowed those applications to remain pending. The Los Angeles applications for rights on Kings River involve lands which are included within the boundaries of a proposed national park. The applications of the city, which have been suspended indefinitely, propose a development of 992,000 hp., or more than ten times the present capacity of the city's plants.

"A water-power development proposed by the city of Everett, Wash., would have interfered with the maximum development of the resources of the stream. An application by the city of Louisville was refused because it would mean the duplication of existing facilities and would require the expenditure of an amount larger than that which the city is authorized to undertake. Another municipal application came from Buffalo, which had to be rejected because the water involved is not under the jurisdiction of the commission and would not be until the provisions of the existing treaty are altered.

MUNICIPAL PLANTS APPROVED

"On the other hand, the commission has approved municipal projects with a total capacity of 411,000 hp., which is 37 per cent more than the total installation in waterwheels in municipal central stations in the entire United States in 1922. Less than 2 per cent of the total of electrical energy produced at a group of 102 stations which generated 100,000,000 kw.-hr. each in 1923 comes from the municipalities of Los Angeles, Cleveland, Tacoma and Seattle, where large-scale municipal operation is conducted.

"Census figures show that in 1922 private stations had 93.7 per cent of the total prime-mover capacity, 94.7 per cent of the investment in plant and equipment and 95.3 per cent of the energy output in kilowatt-hours. The ratios have changed but slightly in the twenty years of record, although the trend is toward an increase in the proportion of the output from private central stations. The number of municipal stations has increased, but for the most part they are small. The average installation in privately owned central stations in 1922 was ten times as great as that in the average municipal station. That ratio is increasing. In 1917 83 per cent of the municipal stations were of less than 500 hp. In that year 20 per cent of the so-called municipal stations generated no power, but purchased it from commercial concerns.

"The water-power act, in extending a preference to states or municipalities, requires the commission to make sure that the plans provide for a development which will 'conserve and utilize in the public interest the navigation and water resources of the region.' It will be noted that the statute does not provide for the construction or the financing of power developments by the federal government. There is a provision for the commission to recommend any project which should be undertaken by the federal government itself. The only action taken under that portion of the law was the recommendation that the development of Great Falls on the Potomac River be undertaken by the United States. The power developments undertaken by the government, for the most part, have been incidental to some other activity.

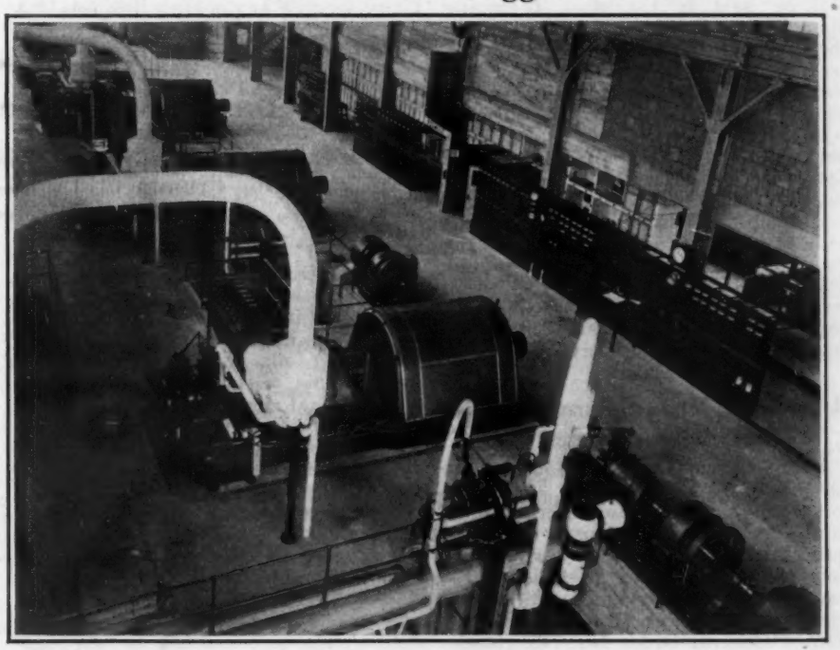
"While the commission must take cognizance of the trend away from the development of power by public agencies, nothing the commission has done or nothing it has in contemplation will militate in any way against the letter or the spirit of the law in its application to power development by public agencies."

Faccioli Discusses Phenomena of High Voltage

Before an enthusiastic audience of more than five hundred Chicago engineers on October 6, Giuseppe Faccioli, works electrical engineer, General Electric Company, Pittsfield, Mass., gave an illustrated lecture reviewing high-voltage phenomena as they affect transmission-line design. This meeting was held jointly by the Chicago Section, A. I. E. E., and the Western Society of Engineers.

Following an academic presentation of the effects of inductance and capac-

Generator Room of World's Biggest Lumber Plant



THE generator room shown in the above illustration is that of the Long Bell Lumber Company on the Columbia River, 50 miles northwest of Portland, Ore. This plant, the largest of its kind in the world, which has caused to spring up around it the new industrial city of Longview, laid out on model lines, is electrically driven throughout. Three 6,000-kw. turbo-generators supply electricity to the mill, the town of Longview and the logging operations of the company at Ryderwood, 30 miles north, and there is space for three more units of the same size. Other information on this plant was printed in the ELECTRICAL WORLD for August 30, page 435.

ity, Dr. Faccioli showed how lightning arresters and transformer insulator troubles were avoided by the proper balancing of inductance and capacity. He gave as the reason why transformer bushing insulators must be designed to withstand about twice normal line voltage that there are cases where a high lightning voltage does not discharge through the lightning gaps but instead travels on to the transformer. At the instant this voltage strikes the transformer the time lag in building up the inductance actually creates an open circuit. Normally the electromagnetic and electrostatic energy of a wave are equal, but at this instant of open circuit the only energy present is the electrostatic, $\frac{1}{2}CE^2$. Thus the bushings to withstand this sudden shock and hammer must be built for approximately double voltage.

Dr. Faccioli presented some very interesting slides showing his experimental work in Pittsfield. With a seven-string insulator arcing over at 450,000 volts wet and 700,000 volts dry at 60 cycles, different corona effects were observed when the frequency was increased to 6,000,000. With the same string of insulators flashovers occurred, when either wet or dry, at the same voltage—1,260,000. The coronas here appeared to be more intense, forming a direct luminous path between the conductor and ground without the extensive flashing close to the insulators which normally occurs at lower frequencies.

A. M. E. S. Will Hold Meetings November 10-14

Section meetings of the Associated Manufacturers of Electrical Supplies will be held in the week beginning Monday, November 10, divided between the association office at 30 East Forty-second Street, New York, and the Hotel Roosevelt, at Madison Avenue and Forty-fifth Street. The standards committee will meet at 9.30 a.m. Monday in the association office and the board of governors at 12.30 p.m. Tuesday at the Hotel Roosevelt. The general meeting of the association will be held on Wednesday at 2 p.m. at the hotel, and the banquet at 7 p.m., same day and place. There will be section meetings Monday, Tuesday, Wednesday, Thursday and Friday mornings and Tuesday and Thursday afternoons.

Informal Hearing on Illinois Overhead Rules

Overhead construction requirements for rural service, railroad crossings, joint pole usage and conflicting lines came up for discussion in a three-day informal hearing held by the Illinois Commerce Commission in Chicago recently. The meeting was called to give further consideration to the substitution of General Order No. 115 (tentative), covering overhead construction, for General Order No. 30, which was adopted several years ago and is still in effect in Illinois. This was the third meeting for this purpose and was attended by representatives of electric service, communication and railway companies.

The new order under consideration is based essentially on the National Electrical Safety Code. It is proposed to require grade C construction in all rural districts and grade B in urban districts. Differences of opinion were expressed regarding railroad crossing requirements, a matter in which there are important differences between the National Electrical Safety Code and the requirements of the American Railway Association. Disagreement also existed regarding joint-pole usage, these hinging chiefly on the voltage limit and on the division of expense when separation become imperative.

There are prospects of another informal discussion before the adoption of General Order No. 115 is brought up at a formal public hearing.

Engineering Employment and the Industrial Depression

Engineering employment throughout this year has been somewhat irregular, according to a survey made by the American Association of Engineers. A particularly unsettled period has been noticeable since June. Most engineers now unemployed are of limited qualifications or short in training and experience, although a few technical experts are actually seeking new connections. The Middle Western States have been least affected, and engineering employment is fairly active in this section. The Far West and Northwest show a lull in employment and a number of large engineering projects have shut down. In the Eastern States manufacturing is not very active at this time. Exceptional activity, however, surrounds the steel cities in Pennsylvania and Ohio. Southeastern and Southern States show considerable activity in civil engineering projects. A few foreign projects have been started by American companies, and there has been some opportunity for American engineers to engage on work in foreign countries.

The lines most active at the present time are highways, public utilities, city and government work. Public utilities rank second with an unprecedented volume of engineering work. The building of transmission lines, generating stations and hydro-electric plants is reported from all parts of the country.

I. E. S. and N. E. L. A. Training Course in Lighting

The fall program of the training course in lighting carried on under the joint auspices of the Illuminating Engineering Society and the National Electric Light Association's Lighting Bureau contains the itinerary and other essential information to those taking the course. The instruction began at Chicago on October 6 and was continued at South Bend, Detroit, Cleveland and Washington. New York was reached on Thursday of this week, and here the course will continue until Wednesday, October 22. The next three days will be spent in Boston, and the arrangements conclude with attendance at the convention of the Illuminating Engineering Society from October 27 to October 31 at Briarcliff Manor, N. Y. Among those who have taken part or will take part in the instruction and discussions are such men as Ward Harrison, M. Luckiesh, Prof. H. H. Higbie, M. D. Cooper, P. S. Millar, C. H. Sharp, G. H. Stickney, C. L. Law, S. G. Hibben, R. S. Hale, D. C. Jackson and W. D'A. Ryan. In every city visited arrangements for inspecting the places of greatest interest to those taking the course have been made.

Pasadena A.I.E.E. Meeting Scores Success

Technical Program Filled with Able Papers, Corona Loss Being One of the Prominent Topics—Institute of Technology Visited—Presentation to Ryan

ONE of the finest programs ever prepared for an Institute convention was presented at the Pacific Coast meeting of the American Institute of Electrical Engineers in session at Pasadena, Cal., from Monday to Friday of this week, October 13 to 17. The national character of the program this year brought together some of the leading engineers of the country for a free discussion of the big problems of the industry. By Wednesday evening the registration had reached 350, with more than fifty prominent engineers from the East in attendance. President Farley Osgood presided at all the sessions and in his presidential address and his remarks as chairman made noteworthy contributions to the proceedings. An elaborate entertainment program was provided for the delegates and the many ladies who accompanied them.

The subject of corona loss and the nature of corona were covered by a group of able papers which constitute a noteworthy contribution to this most important problem of high-voltage transmission. Besides the papers on corona, other notable papers were presented on lightning, high-voltage transmission, electrophysics, telephony and the application of electricity to major Pacific Coast industries.

Among the features of the convention were the afternoon and evening meetings held at the California Institute of Technology, where an opportunity was given to the delegates to learn of the work which has been done by Dr. R. A. Millikan and his associates and to visit the Norman Bridge Laboratory of Physics and the new million-volt laboratory of the Institute of Technology.

A striking tribute was paid to Prof. Harris J. Ryan by his co-workers, in recognition of the notable work he has done on corona and other high-voltage problems, when on Tuesday evening, at the reception given by President Osgood, a presentation, which took the form of a beautiful picture, was made to the former president as a token of the esteem and affection of his fellow engineers.

Dr. Millikan delivered a most interesting and instructive lecture on Wednesday evening on "The Astronomy of the Atom." He pointed out that atomic mechanics differs from astronomical mechanics in only two particulars, one the limited number of orbits and the other the effect of radiation resulting from changes in orbits. He then traced the results recently obtained through the use of high-voltage, high-vacuum, hot-spark spectroscopy. These have enabled him to go two octaves further into the violet spectrum. Such hot sparks possess the property of stepping off the valence electrons of atoms, and experimental results have substantiated and almost conclusively proved the orbital theory of atomic structure and the quantum theory. It is now possible, he said, to analyze the light from any source and determine the nature of its formation and predict from the orbital theory the spectroscopic lines observed.

Tripp Argues for Regulated Superpower

Citing the Apparent Conversion of Great Britain from Belief in Government Ownership to the American Plan, He Calls Latter Basis of Prosperity

BEFORE an audience that crowded the large meeting room of the New York Section of the American Institute of Electrical Engineers on Wednesday evening, October 15, General Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Company, made an able address favoring the development by private capital of large superpower systems which will supply the maximum amount of electric power to the largest number of people at the lowest cost. He referred to the report of the committee of engineers and public men which in Great Britain, under the chairmanship of Lloyd George, has been studying means for solving some of the economic problems of that country and which has investigated American practice. In this part of his speech General Tripp quoted from the report the following passages:

"Experience has been overwhelmingly against the successful administration of a business enterprise by a bureaucracy. . . . There is a common notion that the state can get capital on cheaper terms or bear the losses resulting from unsuccessful management. This we believe to be pure delusion. . . . Our present proposals to develop a nation-wide electrical system place the whole executive management in the hands of private enterprise. . . . Whether we make the right use of this heaven-sent opportunity for redeeming the mistakes of the past by the use of the new power depends upon whether we use from the outset wise methods of regulation and control without sacrificing the driving powers of private enterprise."

ELECTRICITY AND PROSPERITY

Declaring that "human intelligence today knows of no better means for increasing the prosperity of the American nation and the American people than a continuation of electrical development along our present lines," General Tripp went on to say:

"The arguments for government ownership can be easily demolished from a logical standpoint, but logic is not what supports the case for public ownership; it is really founded upon apprehension—a fear that such a great public national service in the hands of private capital would acquire so great a power that it could not be prevented from exploiting the public by means and ways impossible to control."

The way to allay this apprehension in America and to prevent possibilities of public exploitation, General Tripp argued, is further to develop our system of regulating public service corporations, which has so far proved sound and which can be extended to prevent any objectionable practices that may still continue or be devised in the future.

Four Thousand in Sight

Communities to That Number Expected to Take Part in "Better Home-Lighting Campaign"

A TOTAL of 3,624 communities have now reported to the Lighting Educational Committee that they are holding home-lighting contests in their vicinities. This is more than double the estimate which was made at the beginning of the campaign. As classified according to the geographic divisions of the National Electric Light Association, these communities bulk up as follows: Eastern, 917; Great Lakes, 565; New England, 397; East Central, 289; Pacific Coast, 285; Middle West, 269; Southwestern, 237; Southeastern, 213; North Central, 200; Rocky Mountain, 132; Northwestern, 74; Middle Atlantic, 46. It is predicted that the communities participating will exceed four thousand by the time the contest closes.

Electrical manufacturers are continuing to support the movement by subscribing to the fund for the production of literature, national advertising and organization work. Fourteen new subscribers are reported, making a total of 123. These new subscribers are:

American Circular Loom Company, New York City.
Badanes Manufacturing Company, New York City.
Black & Decker Manufacturing Company, Baltimore.
Boston Insulated Wire & Cable Company, Boston.
Brady Electric & Manufacturing Company, New Britain, Conn.
Collyer & Providence Insulated Wire Company, Providence.
M. Eisenberg & Sons, New York City.
Empire Lighting Fixture Company, New York City.
Incandescent Supply Company, New York City.
Moloney Electric Company of Canada, Ltd., Toronto.
New England Incandescent Supply Company, New York City.
Simplex Wire & Cable Company, Boston.
Sunset Lighting Fixture Company, New York City.
United Metal Spinning Company, Brooklyn, N. Y.

I. E. S. Issues Program for Its Briarcliff Manor Meeting

Everything is in readiness for the eighteenth annual convention of the Illuminating Engineering Society, to be held at Briarcliff Lodge, Briarcliff Manor, N. Y., on October 27 to October 31, and it is confidently expected to prove one of the most interesting, instructive and well-attended conventions ever held by the society. The entertainment program is ample and varied, including a "night of light and color" on Wednesday evening, automobile trips, golf, tennis and a revival of the old-time sports of croquet and archery. The tentative business program follows:

MONDAY, OCTOBER 27

Morning.—Registration.

Afternoon.—Address of welcome, Frank L. Young; response, L. B. Marks; president's address, Clarence L. Law; general secretary's report, Norman D. Macdonald; reports of committees: Progress, F. E. Cady; motor vehicle lighting, Clayton H. Sharp; nomenclature and standards, E. C. Crittenden; research, M. Luckeish; lighting legislation, L. B. Marks.

TUESDAY, OCTOBER 28

Morning.—"Predetermination of Daylight from Vertical Windows," H. H. Higbie; report of committee on sky brightness—a symposium on daylight recording: "Records of Total Solar Radiation Intensity and Their Relation to Daylight Intensity," H. H. Kimball; "Records of Daylight by the Photo-Electric Cell," James E. Ives; "Daylight Recording by the New York Edison Company," Walter R. Boyd; "Daylight Recording by the Edison Electric Illuminating Company of Boston," H. J. Baker; paper, "The Chromograph," H. Logan.

Afternoon.—At the Boyce Thompson Institute for Plant Research—a symposium on the effect of light plant growth: Henry W. Popp, John M. Arthur, Dr. William Crocker, Samuel G. Hibben, Victor A. Tiedjens.

WEDNESDAY, OCTOBER 29

Morning.—"High-Intensity Illumination at the McGraw-Hill Publishing Company's Plant," Harold V. Bozell; "Display-Case Lighting in Stores," J. L. Stair and William Foulks; "Daytime Illumination in Show Windows," Ward Harrison and Walter Sturrock; "Periodic Eye Examinations in a Testing Laboratory," Norman D. Macdonald and Dr. James W. Smith; "Ocular Principles in Lighting," C. E. Ferree and G. Rand.

Evening.—"Decorative and Theatrical Lighting," Claude Bragdon; "Closer Cooperation Between Producer and Engineer in Motion-Picture Lighting," Wiard B. Ihnen and D. W. Atwater.

THURSDAY, OCTOBER 30

Morning.—"A Survey of Street Lighting Practice in the United States," J. Franklin Meyer; "Some Results of the Columbus Street Lighting Tests," F. C. Caldwell; "Traffic Control Systems," C. A. B. Halvorson, Jr.; "Short-Cut Design for Electrical Advertising," C. A. Atherton; report of committee on educational courses.

Afternoon.—"The Meaning of Speed of Vision," Percy W. Cobb; "Connection Between Astronomical and Practical Photometry," Prof. Chas. Fabry, University of Paris; "Glare and Visibility," M. Luckiesh and L. L. Holladay; "Is a New Class of Membership Desirable?" Preston S. Millar; "The Luminous Efficiency of 'Cold' Light," Elliot Q. Adams.

FRIDAY, OCTOBER 31

Morning.—Section development meeting under the direction of Incoming President Crittenden.

Joint Meeting of Cleveland A. I. E. E. and A. I. and S. E. E.

The Cleveland Sections of the American Institute of Electrical Engineers and the Association of Iron and Steel Electrical Engineers held a joint session in the quarters of the Cleveland Electrical League, Statler Hotel, on the

evening of October 11. R. S. Shoemaker of the American Rolling Mill Company, Middletown, Ohio, retiring president of the Association of Iron and Steel Electrical Engineers, presided. An illustrated lecture by James Burke, president of the Burke Electric Company, Erie, Pa., on "Synchronous Motor Applications" contained a great deal of information on applications of synchronous and synchronous-induction motors to various classes of service. Data were given in regard to actual savings realized where synchronous motors are used and energy is purchased from central-station companies under a contract enforcing penalties for low power factor. A good discussion followed the lecture.

Kansas Public Service Association's Program

E. A. Stewart of the University of Minnesota will speak on farm electrification before the twenty-seventh annual convention of the Kansas Public Service Association at Emporia on October 24 and 25. Dr. Stewart is director of the Red Wing rural electrification project. Rural electrification in Kansas will be presented by Dr. William A. Jardine, president of the Kansas State Agricultural College, Manhattan. H. S. Warren of the American Telephone & Telegraph Company will address the convention on the problem of inductive co-ordination. J. F. Owens, vice-president and general manager of the Oklahoma Gas & Electric Company, will talk on "Organization and What It Means."

Other subjects to be taken up are: "The Woman's Part in the Public Utility Industry," by Miss Isabell Davie, chairman of the women's public information committee, Middle West Division, N. E. L. A.; "Problems of the Smaller Central Stations in Kansas," "The Municipality and Its Utilities," "What the Information Bureau of Kansas Public Service Companies Is Doing in Kansas," "Superpower, Its Limitations and Possibilities," "Customer Ownership and What It Has Accomplished," and "Public Relations—Whose Business Is It?"

Fall Meeting of Electric Power Club Next Week

The Electric Power Club will hold its fall meeting at The Greenbrier, White Sulphur Springs, W. Va., on Monday to Thursday of next week, October 20 to 23. Some of the items on the program, in addition to the regular reports of the sections, divisions and committees, are talks on "What the Council Is Doing for the Industry," by C. L. Collens, 2d, president Reliance Electric & Engineering Company, Cleveland; "Electric Power Club Business Policies," by E. R. Harding, vice-president Holtzer-Cabot Electric Company, Boston; "Commercial Problems in the Industry," by Secretary S. N. Clarkson, and "Breaking Down Sales Resistance for Electrical Equipment," by Malcolm Muir, vice-president McGraw-Hill Company. The last-named address will be made at the dinner on Wednesday evening. The afternoons will be devoted to sports.

Commission Rescinds Raise

California Body Reverses Its Grant of Temporary Rate Increase to Southern California Edison

ON OCTOBER 11 the California Railroad Commission issued an order rescinding its previous decision granting a temporary increase in rates to the Southern California Edison Company on account of high operating costs brought about by the extreme lack of rainfall in the past winter. This case originated June 4, when the Edison company filed an application in which it stated that operating costs this year would be $5,000,000 more than in a year of average water conditions. It was proposed to meet part of this from its contingency reserve and part from a temporary increase in rates. On August 1 the commission authorized an increase of 10 per cent for a period of eight months on all classes of business except agricultural. Commissioners Seavey and Shore filed a dissenting opinion and called for a rehearing, which was held August 13 to 22. As a result of this hearing the new order rescinding the former decision was issued and signed by Commissioners Seavey, Shore and Whittlesey, with Martin and Brundige dissenting. The latter said that the second hearing had brought out no new evidence, while the majority opinion insists that the principle of rates should be fixed upon the basis of average conditions with no consideration for such unusual conditions as prevailed this year. Edison stocks maintained their strong position following publication of this decision.

Hughes Replies to Canada on Great Lake Diversions

The desire of the Canadian government that the value in terms of power of the water diverted from Lake Michigan by the Chicago Drainage Canal be considered by the United States and Canada apart from the question of diversions from Lake Erie and the Niagara River has not been met by the State Department at Washington. Secretary Hughes' communication to the British Ambassador on this point, dated September 10, has just been made public. The Secretary says:

"The government of the United States is quite willing to have the joint board of engineers develop the facts with respect to any phase of the St. Lawrence problem with a view to arriving at an equitable adjustment of the rights and interests of the two countries therein, but it is not convinced that it would be wise to consider the power value of diversions from Lake Michigan without at the same time considering the power value of other diversions."

Intercompany Co-operation on New Lines

American Superpower Corporation, with Prominent Utility Men as Directors, Buys Stock in Leading Electrical Companies Serving Chiefly the Atlantic Coast

WELL-AUTHENTICATED reports from Philadelphia are to the effect that the American Superpower Corporation, incorporated under the laws of Delaware in November of last year to acquire interests in various power and light companies in the United States and to co-operate with the management of such companies in furthering the best interests of the electrical industry, now holds stock in the Public Service Corporation of New Jersey, the Brooklyn Edison Company, the Commonwealth Power Corporation, the United Light & Power Company, the Tennessee Electric Power Company, the Appalachian Power Company, the Republic Railway & Light Company and other companies.

Among those interested in the American Superpower Corporation as directors are Randal Morgan, vice-president United Gas Improvement Company; T. N. McCarter, president, and P. S. Young, vice-president Public Service Corporation of New Jersey; S. Z. Mitchell, president Electric Bond & Share Company, New York; Landon K. Thorne, president, and Alfred L. Loomis, vice-president Bonbright & Company; B. C. Cobb, president Consumers Power Company; Frank Hulswit, president United Light & Power Company; George Hardy, president Commonwealth Power Corporation; Ray P. Stevens, president Republic Railway & Light Company; W. M. Flook, president Tennessee Electric Power Company; H. L. Stimson, former Secretary of War; W. S. Murray, consulting engineer, New York; H. S. Scarritt, Richard Schaddelle and George Roberts, the last-named being counsel to the company.

The capitalization of the American Superpower Corporation is thus stated: First preferred stock (par $100), $10,000,000; participating preferred (par $25), $7,500,000; common (no par value), class A, 600,000 shares, and class B, 750,000 shares. Of this authorized capital, $2,000,000 of participating preferred shares, 50,000 shares of Class A common and 375,000 shares of Class B common are outstanding. Class B stock, which carries voting power, is now quoted 24 bid, 25 asked, while Class A stock, which does not have voting power, is quoted 23 bid, 24 asked. The 375,000 shares of class B stock, which were issued first, were taken, it is understood, by men interested in organizing the company at $10 a share, and each share carries a warrant entitling the holder to subscribe to an additional share at $10. These warrants have been quoted around $15.

The primary source of earnings of the American Superpower Corporation will be from holdings of stock in the companies in which investment has been made. Statements published so far as to the company's plans and the lines along which it will be conducted are mere newspaper conjecture.

Briefer News

Seattle Electric Club Elects Officers.—Harry J. Martin has been unanimously re-elected president of the Electric Club of Seattle. Other officers are: Phil Apfel, vice-president; Fred Lushington, treasurer; P. L. Hoadley, secretary. The club is making an active canvass for new members.

Hydro-Electric Plant Extensions in Wisconsin.—The Lake Superior District Power Company has added a third 4,000-hp. waterwheel to its plant at Big Falls, Wis., bringing the total rating of this plant to 12,000 hp. A third unit is being added also to the company's plant at Ashland, bringing it to 7,000 hp.

New Substation Goes Into Operation at Hollywood.—The Hollywood section of Los Angeles is now being served from a new municipal substation, the first of fourteen which are to be built from funds supplied by the power bond issue of $16,000,000 authorized by the voters in August. The station is a two-story concrete building of good appearance at the corner of Vine and Romaine Streets. It cost $200,000. Power was turned on on October 2.

Electrical Men Honor Franklin's Memory.—Representatives of the Electric Club of Chicago and the Commonwealth Edison Company joined with other organizations in honoring the memory of Benjamin Franklin on "Constitution Day," September 17. Eric W. Swift of the company hung a kite-shaped floral wreath on the philosopher's statue in Lincoln Park, and Paul W. Koch, president of the club, was one of the speakers. Mr. Swift read a tribute paid Franklin by Thomas A. Edison.

New Central Station for Columbus, Miss.—Erection of a steam generating plant, to cost $2,500,000, on the Tombigbee River at Columbus, Miss., is in contemplation by the Mississippi Power & Light Company as part of its plan for more extensive power distribution, according to C. P. Couch, vice-president and general manager of the company. A high-tension transmission line connecting Columbus and Tupelo will be finished in a few weeks, and future plans include extensions all through the state and into Tennessee and Arkansas and ultimate connection with Muscle Shoals.

Laclede Segregates Electric Property.—The Laclede Gas Light Company of St. Louis has petitioned the Missouri Public Service Commission for permission to sell its electric light and power properties, including the 30,000-kw. central station at Mound Street and the Mississippi River and the distribution system in St. Louis, to the Phoenix Light & Power Company, one of the Laclede company's subsidiaries. The Laclede company announced that this action was taken to segregate the electric properties of the company from its gas properties and to make the electric unit self-containing and self-supporting.

Sir Adam Beck Reports on Queenston Earnings.—Notwithstanding reductions in power rates to a large number of municipalities during the year, the Niagara Hydro Electric System, including the Chippawa development, according to an official statement from Sir Adam Beck, earned a net surplus of $216,699 for the ten-month period from November 1, 1923, to August 31, 1924, after providing for all contingencies. The official expectation is that the surplus for the year will exceed a quarter of a million dollars. The surplus is obtained after allowing $1,375,529 for sinking fund on all the Niagara properties and $694,430 for renewals.

Controversy Over Rates of Consumers Power Company.—The Michigan Public Utilities Commission has refused the request of a number of southern Michigan cities for an appraisal of the properties of the Consumers Power Company, holding that it has no authority to act until a petition affecting rates in the cities is brought before the commission. Franchises held by the power company in petitioning cities expire within the next few years and efforts are being made to arrive at a basis for appraisal on which new charters can be granted. It is expected that the cities will submit tentative schedules to the commission which will clear the way for an appraisal.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See July 5 issue, page 50, for latest list.]

Electric Power Club—Greenbriar Hotel, White Sulphur Springs, W. Va., Oct. 20-23. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

American Society of Civil Engineers—Hotel Tuller, Detroit, Oct. 22-25. C. E. Beam, 29 West 39th St., New York.

Kansas Public Service Association—Broadview Hotel, Emporia, Kan., Oct. 24-25. R. T. Smalley, Kansas Electric Power Co., Emporia.

Illuminating Engineering Society, Briarcliff Manor, N. Y., Oct. 27-31. N. D. Macdonald, 29 West 39th St., New York.

American Welding Society — Hotel Winton, Cleveland, Oct. 30-31. M. M. Kelly, 29 West 39th St.

National Association of Railway and Utilities Commissioners — Phoenix, Ariz., Nov. 11-14. James B. Walker, New York Transit Commission, New York.

Associated Manufacturers of Electrical Supplies — Association office and Hotel Roosevelt, New York, Nov. 10-14. F. Nicholas, 30 East 42d St.

West Virginia Public Utilities Association—Charleston, W. Va., Nov. 14-15. Bliss McCrum, secretary.

Electrical Credit Association (Middle and Atlantic States)—Philadelphia, Nov. 14. F. P. Rose, Marquette Bldg., Chicago.

Electrical Supply Jobbers' Association—Hotel Cleveland, Cleveland, Nov. 19-21. Franklin Overbagh, 411 South Clinton Street, Chicago.

American Society of Mechanical Engineers—New York, Dec. 1-4. C. W. Rice, 29 West 39th St., New York.

Duncan (S. C.) Standby Plant Ready.—The Southern Power Company's 40,000-hp. standby steam plant at Duncan, S. C., is virtually complete and will at once go into service to take part of the company's load. The installation consists of two units rated at 15,000 kw. each, and the expenditure has reached $2,000,000. Work started only nine months ago.

Sensational Charges Against Ontario Hydro-Electric Officials.—The Ontario government is going to appoint a commission to investigate certain charges against officials of the Hydro-Electric Power Commission of that province and certain insinuations contained in a letter written to Sir Adam Beck, chairman of the commission, by his former secretary, Clarence Settell. Settell is now in custody at Hamilton, Ontario, charged with obtaining $29,990 by fraudulently cashing a Hydro-Electric check. This letter has not been made public, but is said to contain startling accusations. The decision to appoint a commission came after the letter had been considered at a special meeting of the provincial cabinet. The commission is being appointed at the request of Sir Adam Beck himself.

Street-Lighting Difficulties in St. Joseph, Mo. — Reconstruction of the municipal lighting plant at St. Joseph, Mo., which has been hanging fire for three years, was again blocked recently by the action of the Mayor in vetoing a motion of the City Council to submit to the people a proposed issue of $300,000 in bonds for this purpose. The Mayor held that that amount was $100,000 more than necessary. An offer of the St. Joseph Railway, Light, Heat & Power Company to furnish energy wholesale was defeated for fear that the Public Service Commission would subsequently increase the rates proposed, even though the manager of the company offered to give a personal bond to secure the city against loss. Meantime inadequate lighting persists.

Federal Report on Alaskan Water Powers.—"The Water Powers of Southeastern Alaska," issued by the United States Government Forest Service with the co-operation of the Federal Power Commission and written by J. G. Dort, hydro-electric engineer of the Forest Service, his figures being based on extended surveys made by him in Alaska in 1921 and 1922, discusses in detail water-power sites in the Wrangell-Petersburg district, which are estimated to have the following capacities: Tyee Lake, on Bradfield Canal, 19,200 hp.; White River, on Bradfield Canal, 12,000 hp.; Harding River, on Bradfield Canal, 23,000 hp.; Cascade Creek, on Thomas Bay, 23,700 hp.; Anan Creek, at Humpback Bay, 6,700 hp.; Mill Creek, near Wrangell, 3,000 hp.; Aaron Creek, Blake Channel, 12,000 hp. The total amount of power available from the known power sites in southeastern Alaska is put at 464,000 hp., an amount held fully capable of manufacturing the immense yearly quantity of paper the forests of this region are able to produce indefinitely.

"Edison Night" on the Air.—October 21, the forty-fifth anniversary of the demonstration of the first successful incandescent lamp, is to be celebrated by a special radio broadcasting program under the auspices of the General Electric Company in at least twelve cities, including points as widely separated as Boston, Dallas and Oakland. Addresses by utility executives and company officials will be given.

Calumet Merger Approved. — The merger of fifteen northern Indiana utilities with the Calumet Gas & Electric Company, one of the Insull group, which was reported in the ELECTRICAL WORLD for September 6, page 481, has been approved by the Indiana Public Service Commission. The total value of the properties, on the basis of reconstruction under 1923 prices, was given as $3,568,492. The company promised that there should be no increase in rates.

Protest Against Overhead High-Tension Line Made in Portland, Ore.—Work on a 60,000-volt line that the Northwestern Electric Company proposed to build through the east side of Portland, Ore., has been halted as the result of protests from organizations and residents, who insist that the wires would be dangerous and should go underground. At the request of the Mayor the company will await the report of city officials, who will investigate the powers of the city in the matter and the safety of the proposed installation and may suggest an alternative route.

Electric Transportation in Chicago.—One hundred and forty-eight users of electric street trucks in Chicago are listed in *Electric Transportation News*, the new monthly organ of the Electric Transportation Club of that city. Of these, sixteen, including the Borden Farm Products Company with five trucks and John Sexton & Company with twenty-six, have begun to employ the electric vehicle in their business since January 1. The Borden company has also a fleet of five trucks doing delivery work in New York City. The American Railway Express Company now operates 1,575 electric street trucks, 124 having been purchased since January 1. Chicago's quota of the total number is 118.

Green River Plans of Utah Power & Light Company.—Further development of the power possibilities of the Green River is planned by the Utah Power & Light Company. An application has been filed by that company with the State Engineer of Utah for permission to use 5,500 sec.-ft. of water from the river for generating electrical energy. The company's proposed development will be in the Split Mountain district, 15 miles east of Vernal, in Uintah County. Construction of a dam 225 ft. high, which will back the water up for miles and form a reservoir with an estimated capacity of 200,000 acre-ft., will be undertaken. The water will be stored from February 1 to July 1. Through a diversion tunnel 24 ft. in diameter and 4,000 ft. long water will be conveyed to the proposed power site, several miles downstream, where power will be generated under a 270-ft. head. At a point about 7 miles upstream from the town of Jensen the water will be returned to the stream. The Utah Power & Light Company holds a preliminary permit for the Green River site from the Federal Power Commission, in conflict with which an application has been made by A. E. Humphreys of Denver and others. (See ELECTRICAL WORLD for August 16, page 332.)

Twin City Belt Line Completed.—The final work in connecting the water-power and steam plants of the Northern States Power Company in the Minneapolis-St. Paul region has just been done through the completion of the 110,000-volt transmission line surrounding the two big cities. This power loop is 60 miles long. Within it are three large steam plants—Riverside in Minneapolis and the High Bridge and Third Street stations in St. Paul. Outside the loop are water-power plants which have a total capacity of about 100,000 hp. The line, which it has taken two years to build and which is one item in the ten-year eighty-million-dollar expansion program of the company, will in itself take care of an increase of 100 per cent in the average electrical energy requirements of the Twin Cities.

Niagara Falls Power Company to Oppose Water Power Commission's Order.—That the Niagara Falls Power Company does not take favorably to the idea of paying to the State of New York approximately $45,000 a year for rental of surplus waters diverted in the Niagara River under the unusual condition that the corporation is to stand the expense without passing it along to its customers is evidenced in an application made to the Water Power Commission at Albany for a conference before the charge against that corporation decided upon by the Power Commission on September 23 is enforced. There seems, however, to be little question that the commission has authority, under the statute of 1922, to impose such conditions as it may deem proper. Whether a conference will be granted or whether the Attorney-General will proceed to enforce collection of the rental imposed, should it not be paid voluntarily, has not been decided, and it is not improbable that the entire matter will be held in abeyance until after election.

Men of the Industry

Prof. Emile Monnin Chamot of Cornell University has been appointed exchange engineering professor to France for the present academic year.

T. W. Brackinreid has been appointed manager of the Public Utilities Commission of Port Arthur, Ontario, to succeed M. M. Inglis, who recently went to Rio de Janeiro, where he assumed new duties with the Brazilian Traction, Light & Power Company. Mr. Brackinreid was formerly engineering and business representative of the Canadian General Electric Company.

Mrs. F. A. Tate of Louisville has been named manager of the investment department of the Kentucky Utilities Company, succeeding Marshall Dale, who has received a new appointment in Indianapolis. Mrs. Tate has been connected with the utilities company for six years and has also acted as secretary of the Kentucky Hydro-Electric Company.

John B. Challies, director of the Water Power Branch of the Canadian Department of the Interior, has resigned that post to affiliate himself with the Shawinigan Water & Power Company. After being graduated from Woodstock College in 1899 and from the School of Practical Science in Toronto in 1903, Mr. Challies joined the Topographical Surveys. In 1911 complete charge of the water-power work of the department of the Interior was given to him. A recognized authority on water-power questions, Mr. Challies had much to do with international waterway problems. He was a member of the Dominion Power Board, of the Lake of the Woods Control Board and of the recently created Dominion Fuel Board.

H. Hobart Porter, president of the American Water Works & Electric Company and a member of the firm of Sanderson & Porter, has been elected to the board of trustees of Columbia University, of which he is an alumnus. Mr. Porter is succeeding Dr. Walter B. James, whose term has expired.

Charles H. Rowland, who was formerly with the General Engineering & Management Corporation's properties at Dalhart, Tex., in charge of operations, has been appointed general manager of the Arkansas-Missouri Power Company, Blytheville, Ark., also a property of the General Engineering & Management Corporation.

Ray Timmerman, who became affiliated with the Adirondack Power & Light Company this summer after severing his connection with the Utah Power & Light Company, has been appointed manager of the Northern Division of the Adirondack organization. This division comprises the distribution districts of Whitehall, Hudson Falls, Fort Ann, Lake George, Glen Falls, Saratoga and Ballston.

Dr. Douglas W. Johnson, professor of physiography at Columbia University, who last year served as exchange engineering professor to France, has been made a Chevalier of the Legion of Honor by the French government in recognition of his work. As exchange professor Dr. Johnson represented Cornell, Harvard, Johns Hopkins, Massachusetts Institute of Technology, University of Pennsylvania, Yale and Columbia, with which the National De-

partment of Public Instruction in France maintains exchange relations in engineering and applied science.

Donald Crafts has been appointed manager of the New Jersey Power & Light Company at Lambertville to succeed **Paul E. Widenor**, who has been transferred to Dover, the company's headquarters.

Lothrop Dow, formerly connected with the sales department of the Detroit Edison Company, has left the employ of that company to become assistant manager of the Northern States Power Company, St. Paul.

C. O. Schooley, formerly resident engineer with the Westinghouse Electric & Manufacturing Company, Lester, Pa., is now assistant engineer with the Standard Underground Cable Company, Perth Amboy, N. J.

I. V. Le Bow has resigned as head electrical engineer with the Terrell Croft Engineering Company, St. Louis, to affiliate himself with the engineering department of the California Oregon Power Company, Medford, Ore.

W. L. Frost, formerly manager of the consumers' department of the Southern California Edison Company, has been appointed general commercial manager of the company. Mr. Frost has been in the service of the Edison company twenty-four years, having progressed from meter reader and lineman to purchasing agent, district manager and assistant to the vice-president.

Frank C. Yerkes, superintendent of the electric meter service department for the Public Service Company of Colorado, has been made manager of the Sterling district to succeed **H. A. Mills**, who has been transferred to the main offices in Denver. Mr. Yerkes has been associated with the company and its predecessors for the past fifteen years.

A. W. Childs, who has served as manager of the commercial department of the Southern California Edison Company, has been made general sales manager in charge of all matters pertaining to the selling of electricity and appliances and devices. Mr. Childs entered the employ of the old Edison Electric Company and has filled the position of district manager, assistant general agent and superintendent of sales.

Edwin Wales Robertson, for many years prominently identified with the public utility business in Columbia, S. C., has recently relinquished his duties as chairman of the board and treasurer of the Columbia Railway, Gas & Electric Company and of the Parr Shoals Power Company, having disposed of his holdings in these and other organizations with which he was affiliated. A native of Columbia and a graduate of Yale University and of the law department of the University of South Carolina, Mr. Robertson soon became an outstanding figure in banking circles in his native city. In 1903 he obtained control of the Columbia Electric Street Railway, Light & Power Company, the name subsequently being changed to the Columbia Railway, Gas & Electric Company. Later he purchased the entire assets of the Columbia Water Power Company and the Columbia Gas Light Company.

E. J. Allegaert New Vice-President in Newark

Edgar J. Allegaert, who was appointed vice-president in charge of electric operation of the Public Service Electric & Gas Company, Newark, as was announced in a recent number of the ELECTRICAL WORLD, has been connected with the Public Service Company and its predecessor companies continuously since 1899. He started with the People's Light & Power Company of Newark in February of that year, keeping consumers' accounts. In 1901, when the People's Light & Power Company was merged with the United Electric Company of New Jersey, Mr. Allegaert became chief clerk of the United company and later in the same year he was made general auditor.

E. J. ALLEGAERT

When the United Electric Company of New Jersey became a part of the Public Service Corporation of New Jersey in 1903, he continued as general auditor of the corporation, also of the electric company. He was born in South Bethlehem, Pa., and spent his early years in Philadelphia.

Franklyn Heydecke has been appointed general auditor of the Public Service Corporation of New Jersey and of the electrical division of the Public Service Electric & Gas Company to succeed Edgar J. Allegaert, recently promoted to the office of vice-president.

Arthur McArthur has been appointed commercial manager of the Nebraska Gas & Electric Company in the Beatrice district to succeed A. A. Olson, now engaging in operating work. Mr. McArthur was associated with the West Missouri Power Company at Pleasant Hill for several years.

William H. Galvani, engineer in charge of property, right-of-way and tax matters for the Pacific Power & Light Company, Portland, Ore., has been retired from active service with that company and has taken up his residence at Seaside, Ore., where he has long owned a home by the sea. Mr. Galvani will retain his connection with the company and will, through frequent visits to Portland, keep in touch with the affairs of his department, so that his many years of experience may be utilized in an advisory way.

Ralph E. Duffy, electrical and construction engineer of the West Missouri Power Company, has resigned to affiliate himself with an electric company in Cienfuegos, Cuba.

Clifford H. Billingsley, general superintendent of the Interstate Light & Power Company at Galena, Ill., which position he has held for a number of years, has been transferred to the Grand Forks division of the Northern States Power Company, with offices at Grand Forks.

L. H. Knapp, formerly assistant general superintendent of the Mississippi River Power Company, has been appointed sales manager of the Paducah (Ky.) Electric Company to succeed Allyn Haigh, recently transferred to Haverhill, Mass. All these utilities are under the Stone & Webster management.

A. A. Olson, formerly in the engineering department of the Nebraska Gas & Electric Company, Omaha, which is controlled by the Continental Gas & Electric Corporation, and more recently commercial manager of the Beatrice district, is now engaging in operating work in that district.

Jack Gillham, who has been underground engineer with the Kansas City Power & Light Company, has severed his connection with that utility to become superintendent of underground for the Portland (Ore.) Electric Power Company. Mr. Gillham, as head of the underground engineering department in Kansas City since 1913, has been an important factor in the development of the company's underground system.

E. L. Milliken, who recently resigned from the assistant managership of the Blackstone Valley Gas & Electric Company, Pawtucket, R. I., to become vice-president and general manager of the Bellamose Corporation, Rocky Hill, Conn., was presented with a silver wassail bowl at a dinner in his honor October 11 at the To Kalon Club of Pawtucket. The hosts were members of the Stone & Webster organization who have been associated with Mr. Milliken in public utility service, and representatives were present from many companies under this management and from the Boston office.

Obituary

Randall Montgomery, vice-president of the Pennsylvania-Ohio Electric Company, with offices in Youngstown, Ohio, died at Chaffey's Locks, Canada, on August 13 as the result of a heart attack. Mr. Montgomery was born in Youngstown in 1851 and had spent his entire life there. In 1889 he became identified with public utility work when he was appointed general manager of the Youngstown Electric Company. He had been an executive officer of the Pennsylvania-Ohio Electric Company for the past twenty-five years and had had many other business interests. During his early life Mr. Montgomery was active in politics, serving as Mayor of Youngstown for two terms, for a similar period in the State Legislature and for three years on the City Commission.

Financial and Corporate

Utility Prices Decline

Upward Trend Terminates When Light and Power Securities Have General Setback

THE heretofore comparatively steady advance of prices in the field of public utility securities came to an abrupt termination last week, and Saturday saw distinct losses for the week in nearly every instance. The explanation of the setback is probably to be found simply in general market nervousness prior to election. Professional traders in stocks, if not actually "bearish," are inclined to lighten their commitments, and selling naturally occurs in that group of securities which shows the greatest profits. The utilities have had a long and well-sustained rise, and the present prices cannot be said in every instance to reflect apparent value. Considerable buying has been based upon future possibilities, and such holdings are generally quickly liquidated at the first indication of an unfavorable market.

An idea of the effect of current selling may be obtained from a comparison of prices on Monday and on Saturday. On the Stock Exchange Consolidated Gas dropped from 72½ to 68½, and American Water Works, opening at 117, closed at about 108. On the curb market Lehigh Power Securities sold down from 88½ to 83, American Gas & Electric from 93 to 83½ and Consolidated Gas, Electric Light & Power of Baltimore from 37½ to 35¼. In the unlisted utilities the drop was similar. Commonwealth Power declined from 103 to 98; Tennessee Electric Power, after making a high above 42, was offered as low as 39, and American Power & Light new stock suffered a setback of six points to 40¾. There appears to be no significance to the present downward trend as far as the condition of the utilities themselves is concerned. Many have thought for a long time that the security prices had been going up too fast, and a reaction was not at all unexpected.

New Offerings Total Twenty-seven Million Dollars

New issues of electric light and power securities during the seven-day period ended October 15 amounted to $27,690,000, $12,500,000 of which the Detroit Edison Company supplied in 5 per cent general and refunding mortgage bonds and $11,700,000 of which the Continental Gas & Electric Corporation contributed by the flotation of 6½ per cent gold bonds at 99 and interest to yield 6.55 per cent. The Continental was an important factor in the recent merger in the Middle West, described in detail in a recent number of the ELECTRICAL WORLD. Its preferred and common stocks have been sold to provide over $5,000,000 cash, which, together with the proceeds of this issue of bonds, will be used to acquire additional securities of controlled companies. The Ohio Public Service Company, which last week was represented by a nine-million-dollar issue of bonds, issued short-term gold notes to the amount of $1,000,000 at 100¼ and interest. The notes, maturing in 1925, together with the other securities, are being issued for the acquisition of additional properties and for other corporate purposes. Two issues of preferred stock were offered, one by the New York Central Electric Corporation in the form of 7 per cent cumulative shares issued at 97½ and accrued dividend to yield 7.18 per cent and the other by the Memphis Power & Light Company, consisting of 5,000 shares offered at $98, annual dividend being $7 per share.

Public Service Stock Sale Ends

On September 30 the sale of 7 per cent preferred stock of the Public Service Company of Northern Illinois came to a close, the surplus remaining after the conclusion of the "rights" period having been absorbed by buyers. The marketing of this surplus constituted the final phase in the operation of placing the security. Stockholders during the "rights" period subscribed 69 per cent of the issue. This in itself was noteworthy. In the experience of all corporations issuing stock at preferred prices to existing stockholders it invariably happens that a greater or smaller number of the latter are for various reasons unable to avail themselves of their "rights." Frequently the proportion of the issue taken by them falls considerably below 69 per cent. Par, the price the Public Service stockholders were privileged to buy the security for, proved a low price, for in the trading on the open market of the Chicago Stock Exchange quotations materially higher were established.

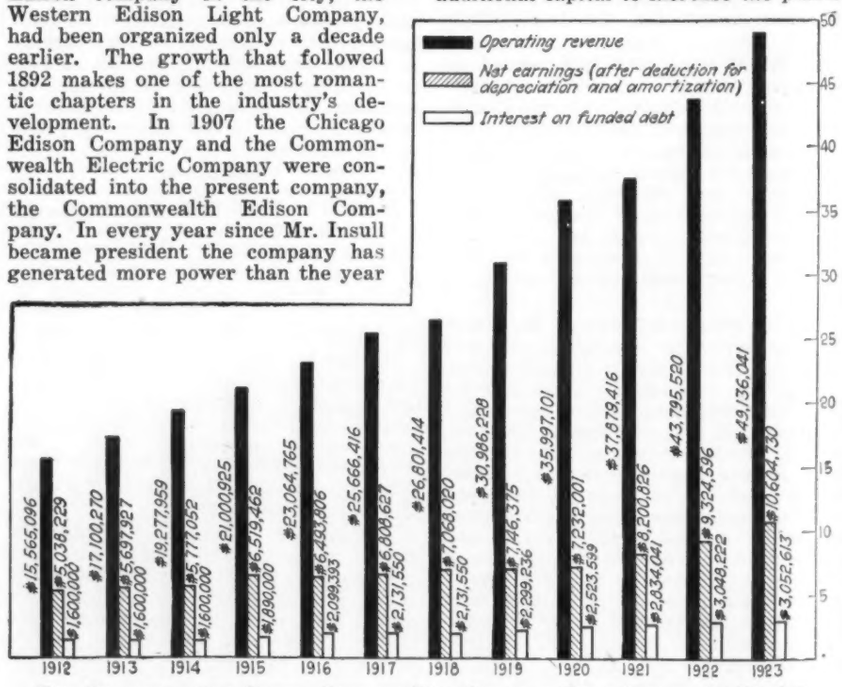
Commonwealth Edison Company's Record

This Company's Operations in Chicago, Under Insull Management for Thirty-two Years, Have Made Its Securities All Investments

BY PAUL WILLARD GARRETT

WHEN Samuel Insull became president of the Chicago Edison Company thirty-two years ago the company did less than half of the city's central-station business. The total generating capacity was 3,180 kw. The first Edison company in the city, the Western Edison Light Company, had been organized only a decade earlier. The growth that followed 1892 makes one of the most romantic chapters in the industry's development. In 1907 the Chicago Edison Company and the Commonwealth Electric Company were consolidated into the present company, the Commonwealth Edison Company. In every year since Mr. Insull became president the company has generated more power than the year before. The capacity had been raised to 758,000 kw. by the end of 1923, a figure that the company has said would be raised to 918,000 kw. by the end of 1924.

Viewed from another angle, the Commonwealth Edison Company's business in 1923 alone increased $6,028,086 to $49,136,042. It was figured that the $6,000,000 increase would absorb between $25,000,000 and $30,000,000 in additional capital to increase the plants and distributing system. The 1924 budget called for $29,375,000 in new construction. Here, then, is one of the country's largest power and light operating companies, which has a virtual



THE COMMONWEALTH EDISON COMPANY HAS SHOWN A RAPID FINANCIAL GROWTH

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par value of stocks is $100.)

Companies	Bid Price Saturday, Oct. 11	Low 1924	High 1924
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	97	94	97¼
Appalachian Power, 7 per cent	90	85½	90
Arkansas Light & Power 7 per cent	90	81	93
Asheville Power & Light 7 per cent	96	96	99
Carolina Power & Light 7 per cent	98	95½	101
Central Illinois Public Service 6 per cent	84	84	87
Colorado Power 7 per cent	92	90	97
Connecticut Light & Power 7 per cent	103	99	106
Consumers' Power 6 per cent	90	85	93
Dayton Power & Light 6 per cent	84	84	90
Duquesne Light 7 per cent	a106½	102	108½
Eastern Texas Electric 6 per cent	100	81	100
Empire District Electric 6 per cent	73	70	78
Fort Worth Power & Light 7 per cent	99	97	102
Great Western Power 7 per cent	98	96	99
Illinois Northern Utilities 6 per cent	82	82	87
Illinois Power & Light 7 per cent	92	84	95
Kansas Gas & Electric 7 per cent	93	92	97
Long Island Lighting 7 per cent	98½	95	98½
Minnesota Power & Light 6 per cent	88	78	89
Mississippi River Power 6 per cent	87	80	90
Nebraska Power 7 per cent	95	89	99
Niagara Falls Power 7 per cent—25	a 28½	27	29
Niagara, Lockport & Ont. Power 7 per cent	101½	99½	104½
Northern States Power 7 per cent	94	91	97
Ohio Public Service 7 per cent	94	86	100
Pacific Gas & Electric 6 per cent	90	85½	92½
Penn-Ohio Power & Light 7 per cent	91	84	96½
Pennsylvania Power & Light $7—no par	99	93	99
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	a 37½	29½	39½
Southern California Edison 8 per cent	116	112	120
Tennessee Electric Power, 6 per cent	78	71	81
Texas Power & Light 7 per cent	96	95	96½
Utah Power & Light 7 per cent	95½	94	96½
Western States Gas & Electric 7 per cent	80	78	85
Yadkin River Power, 7 per cent	97½	94	97½
Holding Companies			
American Gas & Electric 6 per cent—50	44	41½	46
American Light & Traction	94	91	94½
American Power & Light 6 per cent	89	84	91
American Public Service 7 per cent	88	84	92
American Public Utilities 7 per cent	90	73	90
American Water Works & Electric 6 per cent	a 88	66	99
Carolina Power & Light 7 per cent	99	95½	99½
Central Indiana Power 7 per cent	89	80	92
Cities Service 6 per cent	76½	67	77
Commonwealth Power	a 75½	72	82
Consolidated Gas 6 per cent—50	57	51	59½
Continental Gas & Electric 7 per cent	88	69	93
Electric Bond & Share 6 per cent	101	96½	103
General Gas & Electric—$8—no par	102	96	103½
Middle West Utilities 7 per cent	91	80	91
National Power & Light—$7—no par	93	84	96½
North American 6 per cent—50	a 47½	43½	50½
Northern Ohio Electric	a 23	16	34
Public Service Corp. of N. J. 7 per cent	a 100	96½	100½
Public Service Corp. of N. J. 8 per cent	a108½	99½	110
Standard Gas & Electric 8 per cent—50	48½	46½	49½
‡United Gas Improvement—50	a 57	55½	58
United Light & Power—$6. 50—no par	82	75½	84
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	29	22½	34
Appalachian Power—no par	66	66	93
Arkansas Light & Power	60	22	63
Brooklyn Edison	a 116½	107½	120
Buffalo General Electric	149	118	155
Carolina Power & Light	220	82½	245
Colorado Power	33	21	35
Commonwealth Edison	132	126	135
§Consolidated Gas, Electric Light & Power	a 139½	108	148½
Dayton Power & Light	160	70	160
Detroit Edison	a 109	102½	110½
|| Edison Electric Illuminating of Boston	a 182	163½	190
*Kentucky Hydro-Electric	87½	84	87½
Long Island Lighting	175	100	195
Mississippi River Power	32	18½	34
Montana Power	a 65	61½	71
Niagara Falls Power—no par	42	42	48
Niagara, Lockport & Ontario Power—no par	51	45	59
Northern Ohio Electric—no par	7	5	16
Northern States Power	101	92	106
North Texas Electric	61	58	84
Pacific Gas & Electric	a 96	90½	99½
‡Penn Central Light & Power—no par	59½	57	60
Pennsylvania Water & Power	107	98½	110
‡Philadelphia Electric—25	a 34½	29	39½
Public Service Co. of Northern Illinois	97	97	104
Puget Sound Power & Light	50	43½	61½
Southern California Edison	99	95	106
Tampa Electric	a163	134	163
Tennessee Electric Power—no par	39	20	43
Virginia Power	55	16	70
Virginia Railway & Power	a 60½	36	72½
West Penn. Co.	88	47½	98

Companies	Bid Price Saturday, Oct. 11	Low 1924	High 1924
Holding Companies			
‡American Electric Power—50	62	22½	62½
American Gas & Electric—no par	83	43½	97
American Light & Traction	146	115	146
American Power & Light (old)	a480	200	480
American Power & Light (new)	40	34½	48½
American Public Utilities	88	35	97
American Water Works & Electric	a108	40	126½
Carolina Power & Light—no par	220	103	240
Cities Service	142	140	155
Columbia Gas & Electric—no par	a 41½	33	44½
Commonwealth Power Corp.—no par	97½	56	109
Consolidated Gas—no par	a 70½	60½	75½
Continental Gas & Electric	84	49	96
Federal Light and Traction	a 86½	75	86½
General Gas & Electric	55	22	63
Lehigh Power Securities—no par	82	31	89
Middle West Utilities—no par	71	41	86
National Power & Light—no par	159	60	190
Philadelphia Co.—50	a 47½	42½	53½
Power Securities—no par	8	4	14
Public Service Corp. of N. J.—no par	a 59½	39	63
Standard Gas & Electric—no par	a 37	31½	40½
United Gas & Electric (Conn.)—no par	27	14	42
Utah Securities	a 31½	16½	37
BONDS			
Operating Companies			
Adirondack Power & Light	6s 1950	102½	97½ 103
Alabama Power	5s 1946	95½	90½ 96½
Appalachian Power	5s 1941	95	89 95½
Brooklyn Edison	5s 1949	a100½	97½ 102½
	6s 1930	a105	102½ 106½
	7s 1940	a107½	107 110½
Cleveland Electric Illuminating	5s 1939	100½	98½ 101
Commonwealth Edison	5s 1943	99½	95 100
	5s 1953	98½	92 99½
§Consol. Gas, Elec. Lt. & Pwr.	4½s 1935	a 91½	91 95½
	6s 1949	105	101½ 105
Consumers' Power	5s 1936	98½	94½ 99½
	5s 1952	a 89½	87 92½
Detroit Edison	5s 1933	100½	99 101½
Duquesne Light	6s 1949	a105½	103½ 106½
Great Western Power	5s 1946	95	90½ 96
Kansas City Power & Light	5s 1952	a 94½	89 95½
Mississippi River Power	5s 1951	96½	92 97
Montana Power	5s 1943	a 98½	95 98½
New England Power	5s 1951	99	97 100
New York Edison	6½s 1941	a112½	109½ 112½
Niagara Falls Power	6s 1950	105½	104 105½
Northern States Power	5s 1941	a 94	89½ 94½
	6s 1941	a 104½	101 104½
Ohio Power	7s 1951	106	103 106½
Pacific Gas & Electric	5s 1942	a 94½	90½ 95
Pennsylvania Water & Power	5s 1940	99	96 99½
‡Philadelphia Electric	5s 1966	a 101½	97 103½
	5½s 1947	a 103½	99½ 103½
	6s 1941	a 107	103½ 107½
Portland Electric Power	6s 1947	a 97	89½ 97
Southern California Edison	5s 1939	99½	96 100
	6s 1944	102½	100 103½
Tennessee Electric Power	6s 1947	a 98½	93½ 98½
Texas Power & Light	5s 1937	96½	91½ 96½
Toledo Edison	7s 1941	a 109	106 109
Utah Power & Light	5s 1944	a 93	87½ 93½
Holding Companies			
Alabama Traction, Light & Power	5s 1962	80	65½ 83
American Gas & Electric	6s 2014	95½	94 95½
American Power & Light	6s 2016	94	91 94½
Amer. Water Works & Electric	5s 1934	a 92½	84½ 94
Central Indiana Power	6s 1947	94	88 95
Commonwealth Power	6s 1947	a 97½	87 98
Consolidated Cities Lt., Pwr. & Tr.	5s 1962	75½	64 76
Illinois Power & Light	6s 1953	99	95 100½
United Light & Railways	5s 1932	94	87½ 94
	6s 1953	97	92 97½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing		99	90 100½
*National Carbon		118½	112 125
Worthington Pump & Machinery (A)		82½	68 85
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 57½	41½	66½
American Bosch Magneto—no par	a 24½	22½	38½
Electric Storage Battery—no par	a 56½	50½	64
General Electric	a 246½	173½	281
General Electric—10	a 11½	10½	11½
*Hurley Machine—no par	a 59½	48	64½
†Wagner Electric	24½	20	34½
Westinghouse Electric & Manufacturing—50	a 62½	55½	65
Worthington Pump & Machinery	a 39½	23½	47½
BONDS			
Canada General Electric	6s 1942	106½	102½ 107
General Electric	3½s 1942	83	80 83½
	5s 1952	a104½	100 105
Robbins & Myers	7s 1952	71	75 91½
†Wagner Electric Manufacturing	7s	a 101	97 101
Western Electric	5s 1944	a 99	96 99
Westinghouse Electric & Mfg.	7s 1931	a 108½	106½ 109½

*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price Wednesday, October 15.

monopoly now of the Chicago business and which has been obliged from time to time to finance large extensions to its plant. That the management has been so successful in raising funds at advantageous rates is shown in no better way than by a study of the positions occupied by Commonwealth Edison securities.

WHAT THE SET-UP IS LIKE

The Commonwealth Edison Company's financial structure is simple. The total capitalization is $173,317,100, of which $89,774,000 represents bonds and $83,543,100 stock. These figures do not include $21,856,900 additional stock subscribed for by stockholders and being paid for under the deferred-payment plan, a thing which makes some difference in the proportion of bonds to stock. It means that there will be eventually more stock than bonds, although now the bonds exceed the stock in par value. Except for a $6,000,000 issue of 6s, all of the company's bonds bear a 5 per cent coupon rate. Not all companies enjoy so low a rate for their obligations. Incidentally, although the company's bonds are not listed on the New York Stock Exchange, the market in them is more active than in many of the listed issues. A fraction of a point usually covers the bid and offered price, a rare thing in utility quotations and something which indicates good marketability. Interest charges were earned 3.47 times after depreciation and amortization in 1923. Fixed charges have been earned on an average of more than three times for a long period of years.

Even Commonwealth company's capital stock, which is common, has become seasoned to an extent that is true of only a few other utility equity issues. Dividends have been paid regularly by the company and its principal predecessor since 1889, or for thirty-five years. Since 1913 the rate has been $8 a year. The stock has not sold below par since 1909 and long ago passed from the speculative to the investment ranks among utility issues. Gradually the stock has received a wider distribution until now there are approximately 35,000 stockholders. Five years ago there were only 5,840 stockholders and ten years ago only 2,839 stockholders.

At eight different times since the consolidation in 1907 the stockholders have received valuable subscription rights. The regularity with which dividends are paid and the fact that stockholders have come to expect additional rights from time to time have resulted in a situation where Commonwealth Edison stock usually is held permanently by investors.

The interesting record of the Commonwealth Edison Company is all the more significant in that the company has never raised its rates, a statement that applies even to the difficult period during the war when rate advances were finally found necessary in many instances.

Duquesne Stock Listed.—The Pittsburgh Stock Exchange has authorized the listing of 150,000 additional shares of Duquesne Light Company 7 per cent first preferred cumulative series A stock on official notice of issuance.

Dividends Declared

The following quarterly dividends were announced by central-station companies during the seven-day period ended October 14:

Name of Company	Per Cent	When Payable
American Light & Traction, com.	1	Nov. 1
American Light & Traction, com. *	1	Nov. 1
American Light & Traction, pf.	1¼	Nov. 1
Central Power & Light, pf.	1¾	Nov. 1
Edison Elec. Illuminating of Boston.	3	Nov. 1
Electric Bond & Share, pf.	1¼	Nov. 1
Havana Electric Railway, Light & Power, com. and pf.	3	Nov. 1
Idaho Power, pf.	1¾	Nov. 1
Newport News & Hampton Ry., Gas & Electric	1¾	Nov. 1
Public Service Investment, com.	1¾	Nov. 1
Public Service Investment, pf.	1¾	Nov. 1
Sierra-Pacific Electric, pf.	1¾	Nov. 1
Southern Canada Power	$1	Nov. 15
Texas Power & Light, pf.	1¾	Nov. 1

* Payable in common stock.

Company Reports

Among the company reports issued during the past week for the month of August are the following:

Name of Company	Gross Revenues for August 1924	1923
American Tel. & Tel.	$6,251,024	$5,927,782
Barcelona Trac., Lt. & Power	4,140,816	3,826,083
Eastern Shore Gas & Electric	53,298	47,258
Federal Light & Traction	429,025	415,685
Havana Elec. Ry., Lt. & Pr.	1,189,029	1,103,575
Manila Electric	309,730	305,075
Mississippi Power & Light	115,830	96,263
New Bedford Gas & Edison Lt.	273,792	265,302
Sierra-Pacific Electric	90,630	87,568

Kentucky Securities Report. — The Kentucky Securities Corporation for the year ended June 30, 1924, reported a surplus of $448,455 after ordinary taxes, rentals and interest, but before depreciation and federal taxes, which compares with $371,977 for 1923.

Pittsburgh Utilities Quarterly Income Statement.—The income statement of the Pittsburgh Utilities Corporation for the quarter ended September 30 showed net income amounting to $340,041 after charges equal to $1.14 a share on the 240,000 no-par-value common shares outstanding, after allowing for preferred dividends. These figures compare with net income of $341,370, or $1.14 a share, in the preceding quarter.

Public Service of New Jersey Offers New Stock.—Stockholders of the Public Service Corporation of New Jersey of record October 17 will be given the right to subscribe to additional common stock at $60 a share, plus accrued dividends, in the ratio of one share of no-par-value common for every ten shares of both common and preferred. The amount of the additional issue is estimated at between 100,000 and 120,000 shares.

Consolidated Utilities to Readjust Capital.—The stockholders of the Consolidated Utilities Company, New York, have approved of the change in capital structure advocated by the board of directors and as a result the capital of the corporation will consist of $7,500,000 of 7 per cent preferred stock and 75,000 shares of common stock of no par value. Heretofore the capital has been $2,000,000 of common stock of $100 par value and $1,300,000 of 6 per cent preferred. The present shareholders will be given new 7 per cent preferred stock in exchange for the old 6 per cent preferred, the extra 1 per cent providing for the accumulated dividends on the old issue.

Alabama Power Stock Sale to American Company Voted. — The stockholders of the Alabama Traction, Light & Power Company voted unanimously at a recent meeting in Montreal to sell the common stock and other securities which it owned in the Alabama Power Company to the Southeastern Power & Light Company, the American company recently organized to take over these holdings. The details of the capital structure of this new organization were discussed in the September 20 issue of the ELECTRICAL WORLD.

Massachusetts Companies Reduce Par Value of Stocks.—A reduction in par value of common stock from $100 to $25 per share has been approved by the Massachusetts Department of Public Utilities on petitions of the Edison Electric Illuminating Company of Brockton, the Lowell Electric Light Corporation and the Electric Light & Power Company of Abington and Rockland. A. Stuart Pratt of Stone & Webster, Inc., managers of these companies, stated at the hearing that the object of the change was to permit a wider distribution of these securities to be obtained throughout the territories served by them.

California Commission Issues Figures on Security Authorizations.—During the twelve months (fiscal year) ended June 30, 1924, the Railroad Commission of California passed upon applications involving the issue of $245,884,653 of stock, bonds, notes and other evidences of indebtedness by California utility corporations. The commission authorized during this period the issue of $243,869,746 of securities and dismissed requests involving $2,014,906. There were pending before the commission on June 30, 1924, applications for the issuance of $13,874,250 of securities. Of the securities authorized for the fiscal year ended June 30, 1924, 79.11 per cent were for additions and betterments, 3.71 for refunding, 4.76 for collateral and 12.42 per cent for reorganization purposes.

Issues Called for Redemption in October.—The following issues have been called for redemption during the present month: Public Service Company of Colorado, 6 per cent notes, amounting to $3,000,000, due in 1925, at 100½; Central States Electric Corporation, 7 per cent bonds, amounting to $1,661,000, due in 1925, at 100½; Scranton Electric Company, 8 per cent bonds, amounting to $1,000,000, due in 1931, at 103; Durham Public Service Company, 8 per cent bonds, amounting to $644,900, due in 1936, at 102, and the Western United Gas & Electric, 6 per cent bonds, amounting to $510,000, due in 1928, at 100½. It is interesting to note that the Public Service Company's three-million-dollar issue was offered only last May.

Commission Rulings

Return to Company Should Do More than Barely Escape Confiscation.—In determining rates for the Western States Gas & Electric Company the California Railroad Commission said: "The company asks that it be permitted to earn an 8 per cent return, while both opposing counsel contend that 7¼ per cent is sufficient with the inclusion of federal income tax in operating expenses. This figure is based on a Supreme Court decision in which a 7¼ per cent return was held to be non-confiscatory. The commission should not fix a rate for this company which will yield a revenue that will just barely escape the test of confiscation. The company is engaged in construction work and development of considerable magnitude. There is an obligation upon it to continue adequately to serve and upon the public to pay a reasonable and fair compensation for the service the company renders. There has been no criticism of the manner in which its consumers are being served and there can be no doubt that an adequate return should be earned. The cost of money to the Western States company has been found to be 6.74 per cent on securities outstanding July 15, 1923. With this in mind, and considering the service rendered, a return approximating 8 per cent on the rate base must be considered reasonable, provided the resultant rates are not too high."

Oregon Commission Modifies Rural Extension Rules.—The Public Service Commission of Oregon has issued an order modifying its rules for rural electric extension in many ways. Following are quotations from the provisions now adopted: "In any case where the cost to the utility is less than the product of the investment ratio of two and one-half times the estimated annual revenues from the extension, then the free investment required of the utility shall not be less than such product. After the expiration of the first three complete calendar years after service has been first given on any extension where customers' payments are made, any customer thereon may demand a statement of the revenues derived during that three-year period from the original customers or their successors on such extension, and where the estimated revenue used for such extension is less than the three-year actual average shown by the statement, each customer's payment based on such low estimated revenue shall be reduced to the amount which would have resulted from the use of such average annual revenue. The difference between such customers' payments, plus interest at 6 per cent, shall be refunded pro rata to the individual customers or to their successors in the ownership of the property originally served. While we believe that the failure of a utility to estimate properly the cost of an extension should not be permitted to increase the charges to the customer above those quoted to him when the extension was contracted for, we find that the utility should not be forever estopped from obtaining the proper reimbursement for the actual excess cost of the line, provided this may be done when additional customers are connected, and provided further that neither the original nor the additional customers shall pay an excess cost greater than the original estimated cost. We accordingly find that Rule 11 should be modified to read as follows: 'Within two months from the date on which each line extension is completed, the utility shall refund to the customers that amount due by reason of the additional customers having been connected, if any.'" The method for computing the amount follows.

Recent Court Decisions

Commission Law Not to Be So Interpreted as to Permit Injustice by Violation of Contract.—In Pavilion Natural Gas Company vs. Hurst the plaintiff sought to collect $638 from defendant for gas furnished during several years, notwithstanding the existence of a contract by which gas was to be supplied to him free of charge as part of return from the plaintiff for the right to exploit a well on defendant's property. The plaintiff claimed that the contract was void because it was in conflict with provisions of the public service law, but the Supreme Court of New York gave judgment for the defendant, asserting that one of the primary purposes of the Public Service Commission Law was protection against any unfair practices by public service corporations, and that to permit the law to be an instrument whereby a corporation could violate a contract, while holding the other party, would be contrary to the spirit of the statute. (205 N. Y. S. 847.)*

Power of Eminent Domain as Related to Interstate Line.—In Brooke Electric Company vs. Beall the plaintiff sought to condemn a right-of-way over a strip of land owned by the defendant in order to build thereon a line to be used in part to convey power to connecting lines in another state. The defendant claimed that the company could not exercise such power. The Supreme Court of Appeals of West Virginia sustained the plaintiff, saying: "We do not think that the question as to whether or not a public utility company organized under the laws of this state and doing business in the state can exercise the right of eminent domain in this state for the sole purpose of transporting electricity out of the state properly arises in this case, for it is apparent from the application that the applicant is intending, when its lines are completed, to supply electricity to any and all of its customers both within and without the state, and the case of Carnegie Natural Gas Company vs. Swiger recognizes the right of eminent domain to a foreign corporation to condemn private property for its right-of-way for its pipe lines used for the transportation of natural gas out of the state, though only a small portion of the gas along said line is used by the citizens of this state." (123 S. E. 587.)

Conditions Under Which City Can Make Contract with Utility for Future Rates Not Subject to State Regulation.—In the Supreme Court of Errors of Connecticut the city of Ansonia, which brought suit against the Ansonia Water Company, was held not to have power to make such contracts for future rates with a public utility that these contracts will not be subject to regulation by the state. The city had claimed that a recognized exception to the general rule concerning the police power of the state over utility contracts exists in favor of contracts made by express authority of the state between a municipality and public service corporations fixing the rates to be charged by such corporations for a reasonably limited term. The court held that the exception is "narrowly confined to cases in which it clearly and unmistakably appears, first, that the state has delegated its rate-regulating power to the municipality, acting within its geographical limits, and, second, that the municipality has with equal clarity and certainty exercised its delegated power by a contract fixing the rate to be charged for a limited term." These conditions were found non-existent in the case before the court. (125 At. 474.)

Continuation of Service After Expiration of Contract Creates New Contract of Indefinite Duration.—Hill vs. Elizabeth City was a suit brought by bondholders of the Electric Light Company of Elizabeth City, N. C., and the Elizabeth City Water & Power Company for an injunction to restrain the municipality from issuing bonds for the construction of a municipal light, water and sewer system. If the city did this, it was claimed, the company's contract rights would be impaired and its property injured. The contracts with the city had expired, but service had been continued and accepted. The United States Court of Appeals sustained the companies in the claim that this acceptance created a new contract. This, the court said, was of indefinite duration and terminable by either party on reasonable notice, at such time and under such circumstances as might be consistent with the duty both owed to the inhabitants of the city. The companies could not, however, forever deprive the city of the right to use municipal funds in the construction of water and light plants as "necessary expenses." The court therefore sustained the district court in denying the relief sought, advising the contending parties to reach an amicable settlement for the transfer of the plants. (298 Fed. 67.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

A Job for Electrical Credit Men

Why the Local Banker Does Not Know the Local Electrical Business as He Knows Groceries and Automobiles—What We Can Do

By H. A. Lewis
Manager *Electrical Merchandising*, New York

ONE morning, recently, I had a long talk with the president of the leading bank of a small city about the bank's relationship to the local trade—hardware, drugs, plumbing, building, electrical and so on. He dealt particularly upon conditions existing in the local grocery trade. He said: "We have in this town two or three grocery jobbers, and, of course, we have our full assortment of grocery dealers. This institution acts as a clearing point for credit information for these jobbers on all lines of credit that are given to the grocery trade."

He spoke of a certain grocer lately gone into business who was going to fail because he was paying too much rent for his location. He knew the grocery business so well that he could forecast this man's failure.

Then, we talked about the automobile business, and he said: "There is so and so. He is the 'livest' salesman in town. He is the 'livest' dealer here. However, in the last sixty days, he has made a mistake. He has accumulated too many second-hand cars up there." In other words, the banker was close enough to the situation to know that the dealer was carrying too much stock. He intended to advise him to unload.

Then we went on and discussed one or two other trades in the same general sort of way, and I said: "How many electrical people borrow from you?" And he said, "One."

"Aren't there any others here in town?" I asked. He stopped for a minute and named three more.

"Well," I said, "Mr. Banker, do you know that in this town there are thirteen electrical contractors recognized by the electric light company?"

"No, he said; is that so?"

I said: "Yes, sir. Do you know that, in addition, there are twelve curbstoners in this town doing business out of their garages or their kitchens?"

"No."

"Have you any idea of the volume of electrical work going on in this town?"

"No, I can't say that I have."

"Do you realize the number of appliances, washing machines, ironers and things like that being sold on time in this town?"

"No, sir, I don't."

"Well," I said, "how is that? You know everything about the grocery business and the automobile business and the hardware business and the plumbing business here in town. You are loaning money to one contractor, and you do not even know that there are thirteen dealers recognized by the electric light company as being able to do contracting jobs."

"Well," he said, "you are the first man that ever came in here and talked to me about the electrical business."

Jobber Is Banker

That is a true story, and you can multiply it in hundreds and thousands of places. The banker does not know the electrical business; that is, the local banker. He knows the automobile business. Why? The retailer had to be financed locally, and because he had to be financed locally the local banker got into the picture and saw to it that adequate capital was put into the business before he would do his part, and that is also true of the grocery trade and the hardware trade and other similar trades. But here we have a new business, the electrical business. It has come and expanded and expanded, and we have left a very vitally interested party out of the picture—the banker.

In a word, the reason why this is possible is that the electrical jobber has unwillingly assumed the function of banker for the electrical contractor-dealer and is carrying him along when rightly he should be leaning on his local bank. I have discussed this fact with many jobbers recently, and several of them have made investigations to see how many of the contractors and dealers whom they sell have an established line of credit at the bank which they use to enable them to pay their bills on time. As near as I can find out, less than 10 per cent of the local electrical trade are taking advantage of banking credit. They go to a bank and establish a checking account and never go into the bank again. They are completely out of the banking picture. What is the answer?

Does Not Talk Electrical Tongue

There are several answers. In the first place, the banker talks credit, the local dealer talks electrical things. They don't talk the same language. They really need an interpreter, and it looks to me as though the job were up to the credit men of the electrical manufacturers and jobbers. The banker does not know the electrical business, but he is delighted to talk about the electrical business. He wants to know about the electrical business, and we have got to teach him to understand our language. The job is not really so big, because there are only 663 towns of over 25,000 population in the United States. There are 2,127 towns of from 2,500 to 25,000 population, so we have only 2,790 towns to think about in all. If we could get the local bankers in these towns to be 50 per cent as much interested in our business as they are in the automobile business, what would be the result?

In the first place, we would put more financing of retailing and contracting operations at the point where the job is done, and that, it seems to me, is a very fundamental thing. Secondly, we would take considerable of this financing out of the hands of the middlemen, who as traders are poor bankers. Third, we would keep the curbstoners and what they stand for out of the picture.

Will Curb Curbstoner

If this local banker had known as much about the electrical business as he knew about the grocery business in this particular town it would never have been possible for these twelve curbstoners to have existed. He would have seen to it, by advice and action, that the middlemen would

not be supplying credit to them, which is the real reason they ever started in business, and he would have strengthened the backbone of the established dealers and kept them on the road to success, and the curbstoners would have automatically failed on the job.

In this business we need gray-headed advice and counsel, and we need this advice and counsel particularly from men whom we respect and, to a certain extent, fear. That is why it seems to me that the banker, with his years of experience and business knowledge, can give that advice and counsel at the point where we have our relationship with the public. This would make our industry sound and would allow for further expansion, without the strain and the troubles that we have at the present time.

I have recently recommended to the members of the Electrical Credit Association that they establish contact with the banks at which their customers have checking accounts and begin right now to interpret the electrical business to them. I believe that it is a purpose that all of us should make a serious effort to promote.

American Goods Favored Abroad in Face of Competition

WHILE competition in foreign markets is expected to become increasingly keen from this time forward, advices reaching Washington from a large proportion of the foreign centers where consulates are maintained indicate that American products are so well established that more than a small price differential will be necessary to dislodge them. A reputation has been established for quality and for fair dealing. There is a general preference among merchants to be the avenue for the sale of American goods. A cross-section from consular reports indicates that the great increase in American prestige since the war is being reflected in a public demand throughout the world for American products.

Another significant trend in foreign trade is a general awakening on the part of individuals to the fact that they can order small quantities of nearly any article by mail from the country in which it is made. The aggregate of this business is becoming very large, and manufacturers would do well to stress this point in connection with their exports. Americans too are learning that mail orders can be placed abroad, as is indicated by the rapid increases in mail importations.

Survey to Determine Costs of Distribution

A MERCANTILE survey to determine the distribution costs of industries in general is proposed by a special committee, named by Congress, and this committee will formulate a plan. The plan will be submitted to Congress and the necessary authorization for the work sought. Owen D. Young, a member of the reparations committee, will be chairman of the proposed mercantile census committee, which will have headquarters in New York, and F. M. Feiker, vice-president of the Society for Electrical Development, will be vice-chairman.

W. Leonard Thompson, former assistant chief in the domestic commerce division of the Department of Commerce and now a member of the special committee, says: "Secretary Hoover favors the plan and states that it will effect a more orderly marketing of products. It will also give business men a basis for the shaping of business policies, will lengthen the life of business concerns and will make employment more constant. The work will also aid in impressing upon the public that business is a service institution and is entitled to a fair profit for service rendered."

Interchangeable Appliance Plug Advances Interests of Entire Industry

STANDARDIZATION in the electrical industry involves many interests, but, considering the extraordinary development of the appliance art, it is not surprising that unification of design has not made faster progress. In this field the influence of style affects sales far more than in the marketing of apparatus, and it is often hard for the manufacturer to modify the form of his products to insure their more flexible use. At large cost patented features have been incorporated in many electrical conveniences. These features constitute admirable "talking points" in sales efforts, and when the manufacturer is appealed to in the interest of merging certain features of his product with others, or at least establishing more common points of usefulness, it is only natural that now and then he should feel that he is giving up real advantages to his competitors.

From a broader outlook, however, the adoption of appliance designs yielding maximum convenience in use reacts for the benefit of every branch of the industry. The motive for placing a standardized design on the market may be that of selling a device *par excellence* in the mind of its maker, but in so far as standardization permits the use of such a device generally, the popular demand for it and for comparable competitive devices is sure to be substantially increased.

A very significant step in the direction of such standardization has recently been taken by the Simplex Electric Heating Company, Cambridge, Mass., manufacturer of electric heating devices, through the development and placing on the market of an attachment plug and cord which can be used on certainly 95 per cent of the socket heating appliances produced by reputable makers and designed to employ plugs and cords in service. At one end of the cord is a standard screw plug for use at the electric outlet or lamp socket. At the other or appliance end is a plug designed to fit the terminal contacts of appliances having either round or flat prongs. This enables the manufacturer to sell the cord and its attachment plugs as a unit, and it is now being nationally advertised.

The manufacturer is naturally interested in selling as many cord-and-plug units as possible, and in his advertising he features a number of points in the design which have little or no connection with standardization and interchangeability. These competitive claims are of much interest to electrical merchandisers, but from the point of view of the industry as a whole, it is significant that an appliance maker has put on the market a cord-and-plug combination that will fit his competitors' products as well as his own. There results a fundamental benefit to the manufacturer, jobber, contractor-dealer and central station. There is a reduction in varieties of cord-and-plug combinations to be produced in

the factory and carried in wholesale and retail stocks; the general use of appliances of whatever make is encouraged because it is made easier, and the obvious consequence is a larger sale of appliances, cords and energy.

The development of the above cord-and-plug combination, including tests and the acquisition of patent rights upon certain features of the plug at the appliance end of the cord, has taken about two years. It is not understood that the development of the interchangeable feature has been as much of a problem as the provision of means for manipulating the appliance plug when heated in service. Although the manufacturer was pursuing certain ends of potential profit to himself, the fact remains that by this development he has accomplished something of value to the industry in general. Thus has been taken a step toward a more universal use of electric service achieved through unification of a plug design, accomplished by the conservation of material and stock investment in multiplied establishments. The putting of such a product on the market has a cumulative effect on the upbuilding of the electrical appliance trade.

Business Conditions

THE volume of business transacted throughout the country is showing an upward trend, though sales are at times spotty with occasional recessions in volume. Hand-to-mouth buying still exists, but it is not so prevalent. The value of sales of the General Electric Company for the quarter ended September 30 show an 11 per cent decrease as compared with the same quarter last year, and total sales for the first nine months of 1924 are 12 per cent below the same period last year. A manufacturer of control equipment reports that his business shows a decrease of 15 per cent for the same period with many small orders the rule. However, a gradual and steady improvement is expected to better these showings by the end of the year. The activity of the steel companies is again reflected in an order for electrical equipment, to replace the steam installation of the Wisconsin Steel Company, amounting to $250,000.

The steel production as announced for September shows an 11 per cent increase over August and is the second consecutive month in which an increase in forward business was reported. The success of the one-hundred-and-ten-million-dollar bond issue to help Germany is indicative of the confidence of business. In addition, along with a notable increase of applications for loans in the American money market from foreign industrial and business concerns, comes the announcement of a corporation to be known as the American & Continental Corporation for the financing of industrial enterprises in Europe.

In New England the tide of business is rising slowly, with recessions of volume in local districts. Sales are spasmodic in the New York district, but there exists every indication of a slowly moving upward trend. Domestic appliance sales are good and lamp sales are on the increase in this territory. In the Southeast the return of normal fall weather has brought with it the expected increase in business activities, and electrical construction material is moving briskly. Trade is progressing steadily in the Middle West, and central-station construction is proceeding rapidly. On the Pacific Coast there is a noticeable improvement in business since October 1, and apparently Southern California is emerging from its slump.

British to Remove Restrictions on Foreign-Made Radio Apparatus

GREAT BRITAIN is about to remove all restrictions governing the use of foreign-made radio sets and parts. This is expected to open the best potential foreign market to American products. While radio is very popular in the British Isles, there still is room for expansion as it is estimated that only one-seventh of the British population is taking advantage regularly of radio programs. The use of radio in the United States long since passed that mark. It now is estimated that one-fourth of our population is in a position to take advantage of radio service. While it is true that the buying power of the American public is greater than that of the British, it is believed that the British eventually will use as many radio sets per capita as does the United States because of the absence of static conditions and less competition from other forms of amusement.

Fair Demand for Material-Handling Equipment

THE demand for material-handling equipment is considered fair, with the volume of business on the increase. One manufacturer, however, reports that his sales this year are ahead of last year's. The general manufacturing trend has been steadily toward a reduction of costs by the installation of more efficient machinery and labor-saving equipment, which has helped the sales of companies making material-handling equipment. While labor is still reasonably plentiful in many industries, it is believed that much opportunity still exists for the reduction of costs by using machinery for certain phases of the work instead of hand labor. Moreover, the necessity for this will become more evident later, when a stricter competition in many classes of European made articles is expected. The lower labor cost of these European manufacturers can in a measure be absorbed by labor-saving machinery. Manufacturers believe that all of these conditions presage an increasing future business.

Deliveries are very good and in many instances can be made immediately. While manufacturers agree that there have been reductions in neither materials nor labor that will permit of any general lowering of price at the present time, some believe that the price trend may be slightly downward, while others think that it will be upward, if anything.

September Delinquent Electrical Accounts Increase Slightly

FOUR of the five divisions reporting to the National Electrical Credit Association showed increases in the number of delinquent electrical accounts for September, 1924, over the previous month. Despite this increase in number of accounts, the average amount for this period was decreased. Comparing September, 1924, with September, 1923, both the number of accounts and the average amount were lower for the first-named month in three of the divisions. For the central division the September, 1924, accounts increased thirty-six over August, 1924, although the average amount was lowered $7.46. In New York a similar condition exists. In the New England and Pacific Coast territories—both having the lowest number of accounts—the accounts for September, 1924, increased over August, 1924, while the average amounts decreased. The complete report is tabulated above.

DELINQUENT ACCOUNTS IN SEPTEMBER

Branch and Month	Number of Accounts Reported	Total Amount	Average Amount
Central Division:			
August, 1923	739	$114,261.15	$154.61
August, 1924	935	109,854.37	117.49
September, 1923	760	95,252.94	125.33
September, 1924	971	106,842.84	110.03
New York:			
August, 1923	380	70,770.00	186.00
August, 1924	301	49,874.00	167.80
September, 1923	365	61,731.00	169.00
September, 1924	338	55,652.00	165.00
Philadelphia:			
August, 1923	176	20,660.96	117.39
August, 1924	244	24,207.92	99.21
September, 1923	246	27,955.15	113.64
September, 1924	243	28,231.73	116.18
New England:			
August, 1923	54	5,117.10	94.76
August, 1924	55	9,953.40	180.97
September, 1923	56	8,156.49	145.65
September, 1924	62	6,385.51	102.88
Pacific Coast:			
August, 1923	17	2,583.80	151.99
August, 1924	15	2,564.12	170.94
September, 1923	26	6,998.20	269.16
September, 1924	25	3,137.67	125.50

Non-Ferrous Metals Advance Slightly—Market Inactive

ALTHOUGH the demand has not been particularly active, all the more important non-ferrous metals have advanced slightly in price. The improved conditions abroad, including the success of the German loan, probably have affected the market

NEW YORK METAL MARKET PRICES

	Oct. 8, 1924 Cents per Pound	Oct. 15, 1924 Cents per Pound
Copper, electrolytic	12⅞	13⅛
Lead, Am. S. & R. price	8	8
Antimony	11¼	11¼–11½
Nickel, ingot	29	29–30
Zinc, spot	6.55	6.65
Tin, Straits	49¼	49¼
Aluminum, 98 to 99 per cent	28	28

somewhat, but aside from this there has been a real and sustained demand from Europe recently for copper, lead and zinc in substantial quantities. A very fair tonnage of copper was sold at 13⅛ cents per pound early in the week, which is the price quoted by practically all sellers. Most sales have been made to wire and brass mills—the latter showing more interest in the market than for some time.

The official contract price of the American Smelting & Refining Company for lead remains at 8 cents per pound with the market unchanged except for perhaps a little more activity. Several hundred tons of lead, however, have been sold at a premium of ten to fifteen points, though most of the demand is still being supplied at the even figure.

The demand for zinc for domestic consumption has been light, but several good orders received for export have materially helped the situation. There are few anxious sellers at present prices, as it is believed that there is liable to be an increase in the demand with an upward movement of prices at any time. The tin market is unchanged as far as demand is concerned, but has been slightly more active.

Trade in the Southeast Reacts Favorably to Better Weather

THE return of normal fall weather has brought with it the expected increase in business activities in all lines after the slowing up experienced on account of the long stretch of recent rainy weather. Construction started in nine Southeastern states during September amounted to $46,366,700, and though this is a 16 per cent decrease from August, it is 31 per cent over September, 1923. Total construction in these states this year amounts to $457,893,900 and represents a 19 per cent increase over the first nine months of 1923. All jobbers report good business in electrical construction material and supply lines, though some of the small contractors are not placing orders up to their usual standard. Heating devices are moving briskly and good stocks are the rule.

The commercial lighting campaigns that have been conducted by a number of the large central-station companies in this section this fall have considerably stimulated the movement of commercial lighting fixtures, and sales of lamps are up to estimates made earlier in the season. The improvement in industrial lines is responsible for a number of satisfactory electrification jobs being closed recently. These jobs will call for large amounts of wiring materials, lighting fixtures and motors in the near future. The receipt of one order for telephone extension work was reported last week and consisted of two cars of four-way clay conduit, one car guy strand, one car insulators, one car No. 12 copper and 500,000 ft. of twisted-pair. Another jobber also has in hand a twenty-one-thousand-dollar "white-way" order. Poles and line materials are in generally good demand.

Sales Spasmodic but Trend Upward in the New York District

SALES in the New York district are more or less spasmodic, but despite this there exists every indication of a slowly moving upward trend. Central stations are still active in the purchase of secondary equipment. Those utilities serving seashore resorts are busily making extensions and improvements at this season. Among orders placed recently for this work is one for about $6,000 worth of poles. Other orders recently placed are one for $350,000, including a 10,000-kw. turbine with auxiliary turbines and condenser equipment, for a South Carolina utility; one for $50,000 worth of switching equipment from a central station to be used in connection with properties whose acquisition has been finally approved by the Public Service Commission, and another for power transformers amounting to approximately $15,000. The electric railway field is also active and some large equipment orders have been placed.

The volume of business transacted by jobbers varies from week to week and sometimes causes an element of doubt as to the trend, but it is still upward. Washing-machine sales are good and vacuum cleaners are moving better, as well as heating appliances such as heating pads, etc. A good increase is also noted in the sales of lamps. Cautious buying remains evident in the daily transactions and purchasing is mostly for immediate requirements.

Business Trend Continues Upward in the New England District

LITTLE by little the tide of business rises in the New England district, although occasional recessions in volume occur in local districts. Last week's sales of wiring material were well distributed, and purchases for outdoor construction were active. Wire orders were non-spectacular, but one sale of 30,000 ft. of special weatherproof went to western Massachusetts and Cape Cod is buying pole-line hardware. In central Maine there is a good demand for line material. Connecticut is also planning on a substantial amount of outside work this fall. Buying by contractor-dealers is well sustained, although building contracts are running under last year's totals.

Motor sales in this district are beginning to pick up slightly and a 1,000-kw. sewage-pumping station job in Boston is scheduled for early consideration, following the award of a service contract by the city to the Edison company. Sales of radio apparatus are vigorous, the demand for the so-called public address system being prominent. Appliances are moving more freely and radiators are a feature of the market for socket devices. Prices are steady and stocks ample.

Middle Western Trade Steadily Progressing

BUSINESS continues briskly in Middle Western territory. Central-station construction is going forward rapidly and purchases have increased, tending materially to improve business. The principal demand was for secondary equipment such as meters, etc., with one manufacturer reporting the receipt of a sizable order. A large order for busbar copper was also placed this week, and there was an active demand for poles and pole-line hardware. Motor sales were not noticeably large, although some very desirable small orders were received. High-tension-equipment sales remain good.

Jobbers experienced a rather good week. Business was obtained in most lines and in a satisfactory volume. The number of inquiries increased and quite a large volume of business was obtained from the contracting trade. Conduit sales increased and the demand for code wire was good. Several large orders were obtained for fuse equipment. Appliance sales have increased in volume, and radio sales have decreased slightly owing to the warm weather. Building activity continues, and it is expected that if the present mild weather remains through the month, a good volume of business will continue to be derived from the sale of electrical construction material.

Noticeable Improvement in Business on the Pacific Coast

THERE has been a noticeable improvement in business on the Pacific Coast since October 1, and southern California is apparently emerging from its slump. This is attributed partly to the recent rain, which was copious and well distributed. Last season's drought has certainly hampered the electrical business, directly through the power shortage and indirectly because of poorer crops. It is estimated that hardly more than one thousand electrical ranges will be sold within the state this year, whereas the campaigns planned and the excellent sales staffs available early in the year would have perhaps sold nearly ten times that total. The uncertainty over the presidential election appears to have markedly decreased, but the fact that the water and power bill, providing for the state acquisition of hydro properties, will again appear upon the November ballot causes unsettlement. Prices are stronger, although no increases in important lines are as yet recorded.

Domestic appliances are selling very well in the Northwest section. Central stations in this territory will bring their present range campaigns to a culmination about November 1 and formulate plans for next spring's campaigns. Schedule material, such as sockets, switches and the like, is selling in good volume despite extremely cautious ordering. Many signs indicate the gradual transition in character of demand for even well-established staples and the increasing insistence upon decorative as well as manufacturing excellence. For example, it is noticed that toggle or tumbler switches will apparently soon outsell the equivalent push types.

Activities of the Trade

Sangamo Electric Company Building New Laboratory

The Sangamo Electric Company, Springfield, Ill., is erecting a new engineering and research laboratory which will have complete facilities for meter engineering and research work. This new building, of reinforced concrete and brick, will be completed in December and will occupy a ground space of 76 ft. x 130 ft. The building will be fully equipped for all kinds of experimental work, physical, electrical and chemical. In addition, there will be a large and well-equipped library.

New Lapp Insulator Plant Now in Service

The Lapp Insulator Company, Le Roy, N. Y., has now placed in service its new plant unit designed and built by the Austin Company, Cleveland, for the production of high-voltage insulators and porcelain tubes. The continuous-oven process of manufacture has been installed to enable the Lapp company to keep pace with the modern trend and supply the demand of power companies and public utilities that are increasing the voltage of their high-tension lines. The new unit doubles the plant capacity and the 600-ft. traveling telpher, which Austin engineers helped design, will reduce the labor costs for this operation approximately 50 per cent.

Incandescent Lamp Patents Again Sustained

The United States District Court in Minneapolis, Judge W. F. Booth, has handed down an opinion in the suit of the General Electric Company against the Minneapolis Electric Lamp Company, finding the Just & Hanaman patent No. 1,018,502 and the Langmuir patent No. 1,180,159 valid and infringed by the automobile lamps made and sold by the Minneapolis company. A preliminary injunction was granted.

Westinghouse Receives Orders for Motors and Power Equipment

A contract for the electrical equipment for a new municipal plant has been awarded the Westinghouse Electric & Manufacturing Company by the city of Owatonna, Minn. The apparatus consists of two 625-kva. bleeder-type turbo-generator units, operating at 3,600 r.p.m., three-phase, 60 cycles and 2,300 volts. Two 1,500-sq.ft. unit-type surface condensers with motor-driven pumps and air ejectors are also furnished with the turbines.

An order amounting to $250,000 has also been received from the Wisconsin Steel Company, a subsidiary of the International Harvester Company, for electrical equipment to replace the present steam installation. The order consists of a 7,000-hp. motor to be used for a 40-in. reversing blooming mill. The contract also includes motor-generator and exciting sets, blower and air-washer equipment, transformers and complete control apparatus.

United States Steel Corporation Buys Cyclone Fence Company

The United States Steel Corporation has acquired the plant and other assets of the Cyclone Fence Company. The transfer of the Cyclone properties includes its factories at Waukegan, Ill., Cleveland, Ohio, Fort Worth, Tex., and Newark, N. J. It is understood that no change in policy is contemplated, the business to continue as a subsidiary of the steel corporation under the name of the Cyclone Fence Company.

Weyerhaeuser Sales Company Announces a New Service

Through an extension of logging operations into some new tracts of Idaho red-cedar pole timber, the Weyerhaeuser organization now makes available to the buyer of poles a new and additional dependable source of supply. In line with the Weyerhaeuser desire to control the sales and service ends of its business as well as the production end, storage facilities have been enlarged and improved, and the entire cedar operation of the business is now in charge of experienced pole men from production to final inspection and shipment. The large pole stocks formerly sold through jobbers are now being marketed directly by the company.

Electric Truck Manufacturers Active

All of the electric truck manufacturers are actively engaged in sales campaigns to broaden the territory of their sales staff. Among the cities covered recently by new agencies of the various truck manufacturers is Minneapolis. The Walker and Ward companies have appointed an agent in Minneapolis, and the Minneapolis Electric Company has appointed one of its representatives to assist locally in promoting electric truck sales.

Lindsley Brothers Company Changes Distribution Policy

In accordance with its new policy to sell direct to the trade, the Lindsley Brothers Company, pole producer, Minneapolis, has appointed two district sales representatives, effective October 1. The New York office, 150 Nassau Street, will be in charge of Walter E. Mitchell, who was formerly with the Southern Exchange Corporation. J. W. Leiendecker was chosen for the Kansas City district. The company's former method of distribution was through jobbers.

Curtis Lighting Creates Training Course on Illumination

A training course to cover all branches of the science of illumination has been established by Curtis Lighting, Inc., Chicago. This course is offered ten young college graduates, who will spend five weeks in each of the major departments and ten weeks in the engineering department, making a total of fifty weeks for the complete term of training. A knowledge of the work of the factory, service, sales, administration, advertising, designing and engineering departments will give each man an opportunity to indicate his preference when he finally completes the course. The training is supervised by Norman B. Hickox, sales manager, and J. L. Stair, chief engineer.

General Electric Company Orders Show Decrease

Orders received by the General Electric Company for the three months ended September 30 totaled $58,389,832, as compared with $65,483,549 for the same quarter in 1923, a decrease of 11 per cent, according to a statement made by Gerard Swope, president. For the first nine months of the present year orders totaled $203,097,719, as compared with $229,747,304 for the same period in 1923, a decrease of 12 per cent.

The National Lead Battery Company, St. Paul, has acquired the plant and equipment of the Red Top Steel Company, Chicago Heights, Ill., which will be equipped as a branch plant to serve the Chicago district. The new property consists of a one-story building, containing 20,000 sq.ft. of floor space and 2½ acres of adjoining ground with railway siding.

The National Carbon Company, New York City, has just awarded contracts for the erection of additions and improvements to its plant at Fostoria, Ohio, which is engaged in the manufacture of electrodes for flashlight and radio batteries.

The Weston Electrical Instrument Company, Newark, N. J., in inclosing with its apparatus a booklet which brings to the attention of the purchaser the manufacturing accomplishments necessary, as well as pointing out to the buyer the service that is behind every Weston instrument.

The Crescent Electrical Supply Company, Dubuque, Iowa, Titus D. Schmid president, has purchased the Tri-City Electrical Supply Company, Davenport, Iowa. The Davenport company will be operated as a branch of the Crescent company. Thomas F. Kelley, secretary and treasurer of the Crescent company, will have charge of the Davenport branch.

The Electric Controller & Manufacturing Company, Cleveland, has supplied the two control switchboards used on the "Henry Ford II," the new freighter built for the Ford Motor Company, which is operated entirely by electricity. These boards are made up of "EC&M" automatic starters for starting and stopping various motors used on pumps, fans, etc.

The Liberty Battery Manufacturing Company, Baton Rouge, La., recently organized with a capital of $80,000 for the manufacturing of batteries for farm-lighting plants, has acquired a building and will install machinery and equipment at once. J. H. McLean is president and general manager.

The Porcelain Insulator Company, Lima, N. Y., manufacturer of insulators and insulating materials, has acquired the buildings and warehouse of the Lord Lumber Company to be utilized for extensions to the present plant.

The Globe Electric Supply Company, Denver, has been designated as distributor in the mountain region for "Serv-el" refrigerating equipment. Thomas M. Knight, formerly a technical executive of the Dupont company, has been placed in charge of the new department established by the Globe company.

The Industrial Controller Company, Milwaukee, Wis., has appointed the Ward Engineering & Battery Company, Jacksonville, Fla., R. E. Ward president, as district sales agent for Florida.

The Howell Electric Motors Company, Howell, Mich., has appointed Fred K. Stone district manager of the New York office at 17 East Forty-second Street to succeed Raymond W. Baker, who recently resigned.

The Sundh Electric Company, Inc., 5 Avenue C, Newark, N. J., announces the appointment of the following sales representatives: R. J. Kirk, 7 East Nineteenth Street, Kansas City, for Missouri, Nebraska, Kansas and Iowa; Lyman C. Reed, 515 South Peters Street, New Orleans, for Louisiana; W. A. Gibson, 5 Roos Building, Dallas, for Texas and Oklahoma, and E. H. Albrecht & Company, 310 Lewis Building, Portland, for Oregon.

The Newark Electrical Supply Company, 223 Market Street, Newark, N. J., jobber, has published the first of a series of booklets, called "Sales Ideas," which will be sent out monthly and which contains suggestions on the building up of sales and profits.

Charles A. Etem, who operated a manufacturers' agency in Minneapolis for several years, under the name of the Chas. A. Etem Electric Company, has moved to 3927½ Melrose Avenue, Los Angeles, where he is opening up a new sales office. The Leich Electric Company of Genoa, Ill., manufacturer of telephone switchboards, etc., has appointed him as exclusive selling agent in the Los Angeles territory.

H. D. Benninger, for the past twenty-six years a mechanic and engineer with the Bethlehem Steel Company and the New Jersey Zinc Company, has been appointed distributor for the Duro automatic water systems and the Matthews automatic lighting plants, with offices in Clifford Park, Allentown, Pa. Mr. Benninger will also specialize in industrial electrical engineering.

The Mutual Electric & Machine Company, Detroit, is now manufacturing its "Bulldog" safety switches in a new "Luminized" finish — an aluminum-deposit process. It is said that with this new finish the switch is much more readily visible and presents a cleaner appearance.

The Tork Company, 8 West Fortieth Street, New York, has taken over the manufacture and sale of "Kwixset Timers" previously announced by the Howard Time Appliance Company of Boston. These devices have been perfected and put into production and announced to the trade under the name of "Tork Timers."

The Marion Electric Corporation, Marion, Ind., is now manufacturing a new heater of the bowl-reflector type known as the "No. 106 Red Streak Radiant Heater."

Brown Boveri & Company, Baden, Switzerland, are devoting increasing attention to the manufacture of large transformers and have lately supplied a number for outdoor use to the Swiss Federal Railway authorities. Similar sets are also in course of construction for Brugg, Bussigny & Seebach. The electric locomotive department of the company is also busily employed; among the orders in hand being engines for the Dutch East Indian, Japanese and Norwegian State Railways.

The Walker Vehicle Company, Chicago, has opened a service branch in St. Louis.

The General Electric Company held a general meeting and conference of its street-lighting specialists at Swampscott, Mass., September 16 to 19. Discussions of traffic, highway and general street lighting and an inspection of lighting devices and manufacturing facilities of the department at the River Works, West Lynn, were included in the program.

New Equipment Available

Automatic Reclosing Circuit Breaker

An automatic reclosing circuit breaker which normally is full-automatic in its operation but may at any time be operated in the same manner as a manually operated circuit breaker has been recently developed by the Automatic Reclosing Circuit Breaker Company, Columbus, Ohio. The operation of the breaker is controlled by a double-pole push-button switch which in the "off" position completely disconnects the control circuit so that it can be operated manually. Breakers of this type are now available in capacities up to and including 2,000 amp.

Current Transformers

Current transformers designed for accurate metering where the secondary burden is high have recently been placed upon the market by the Sangamo Electric Company, Springfield, Ill. These transformers are known as types F and G. Both types are rated at 50 volt-amp. and are built in capacities from 5 amp. to 1,000 amp. The type F is intended for use on circuits not exceeding 7,500 volts, 25 to 133 cycles, while the type G is intended for use on circuits not exceeding 15,000 volts, 25 to 133 cycles. Both types are also built with two separate secondary circuits, one for meters and the other for relays and other auxiliary appliances.

Amplifier Fault Locater

An amplifier of portable type for magnifying indications of the line and cable testing interrupter is being manufactured by the Lundin Electric & Machine Company, Boston. The device utilizes an "A" battery, a "B" battery and a "WD-11" tube. When carried on the trouble hunter's car it can be used while the motor is running and the car in motion in tracing an open circuit as on a street-lighting system. With head telephones the operator's hands are free for driving, and when used with a triangular coil, overhead grounds and a considerable percentage of cable grounds, ordinarily difficult to locate because of weak signals, can be readily spotted. Leaky pin-type insulators can also be more effectively discovered.

Traffic Control and Timer.—A line of adjustable automatic timing devices which flash lights on and off at predetermined periods has been developed for traffic controls for "stop and go" signals by the Reynolds Electric Company, 2650 West Congress Street, Chicago. The timing adjustment for any set of contacts and drive pulleys is obtained by turning a thumb screw, a 50 per cent variation being obtainable in this manner. The mechanism is the same as used by the Reynolds company in its "Reco" flashers for the last twenty-five years.

Friction Head Screwdriver.—An electric screwdriver, designed with a disk-type friction clutch which is automatically adjusted according to the pressure applied by the operator, has been placed on the market by the Hisey-Wolf Machine Company, Cincinnati. It is equipped with ball bearings throughout and is provided with a Hisey universal motor. Screws up to No. 14 in. x 2½ in. long can be driven in soft solid wood. The machine can also be used for setting up nuts up to ⅝ in.

Can and Barrel Washing Machine.—A new electric can and barrel washing machine that performs the operations of rinsing, washing, drying and sterilizing has been placed on the market by Francis Williams, 437 Call Building, San Francisco. A standard double machine with two carriages and utilizing two operators can handle approximately 300 cans per hour. The washing solution is kept hot by a 15-kw. Westinghouse heating element. Air for sterilizing and drying is heated by coils beneath the tank and forced by a blower around the cans. A ½-hp. motor operates the washing brushes and a ¼-hp. motor drives the blower, both motors being of Westinghouse make.

New Trade Literature

AUTOMATIC STATION-CONTROL EQUIPMENT.—The General Electric Company, Schenectady, N. Y., has issued a bulletin, as No. 47,731, describing the uses and advantages of its automatic station-control equipment. It also contains a list of installations up to Jan. 8, 1924, giving the name of the company, capacity, etc.

ELECTRIC MOTORS. — The Century Electric Company has issued a price list of the "Century" squirrel-cage induction polyphase motors, three-phase and two-phase, type "SC," ½ hp. to 50 hp.

CANDLE SOCKETS.—Bulletin No. 17-26A, issued by Harvey Hubbell, Inc., Bridgeport, Conn., covers the "Hubbell" candle sockets.

DIESEL ENGINES.—The Busch-Sulzer Brothers Diesel Engine Company, St. Louis, has issued a catalog on the Busch-Sulzer Diesel engines. It contains an article on the Diesel principle, comparison of efficiencies of various types of power plants and general advantages of Diesel engines over other types of prime movers. Illustrations are given of the first engine built in 1898 at St. Louis and of various plants showing Diesel-engine installations. The catalog also gives a list of 136 central stations using 265 Diesel engines.

LIGHTING SPECIALTIES.—A complete new set of data sheets on "Red Spot" specialties, including its ornamental line, has been issued by the F. W. Wakefield Brass Company, Vermilion, Ohio.

TURBO - GENERATORS. — "Westinghouse Turbine-Generators" is the title of circular No. 1704 issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., which describes and illustrates the "Westinghouse" turbo-generators from 500 kw. to 6,000 kw. This circular gives an outline of the early history and progress of steam-turbine development from the first commercial installation made by George Westinghouse in 1899 in the plant of the Westinghouse Air Brake Company at Wilmerding, Pa., to the present time.

VERTICAL ALTERNATORS.—"Vertical Alternators" is the title of bulletin No. 840 published by the Electric Machinery Manufacturing Company, Minneapolis, covering its "E-M" vertical alternators for use in water-power plants. Illustrations are given showing installations in various plants.

LIGHTING PROBLEMS. — The Cooper-Hewitt Electric Company, 95 River Street, Hoboken, N. J., has published a small booklet entitled "Cooper Hewitt Work Light," designed for manufacturing executives, industrial engineers and architects, in which it gives an outline of adapting light for various purposes and the development of the "Cooper Hewitt work light." Instructions are given regarding the installation of the system and maintenance of same. Illustrations are given showing various installations of the system in industrial plants, textile mills and printing plants.

FIBER AND FIBER PRODUCTS.—The Spaulding Fibre Company, Tonawanda, N. Y., has issued a new catalog covering the "Spaulding" products, including hard fiber, fiber products, and "Bakelite-Duresto." It gives a description of the process of manufacturing hard fiber and a list of the uses of the fiber products for electrical, automotive, general industrial and other purposes.

PERMEAMETER.—A pamphlet has been issued by Frank P. Fahy, 50 Church Street, New York City, describing the "Fahy" simplex permeameter, laminated type, for magnetic testing.

SINGLE-PHASE AND POLYPHASE TRANSFORMERS. — Bulletin No. 2,035 issued by the Pittsburgh Transformer Company, Pittsburgh, covers the "Pittsburgh" single-phase and polyphase transformers. It contains descriptions and illustrations of the various types of the transformers, together with their accessories, including tanks and radiators, etc.

Foreign Trade Opportunities

ROTARY CONVERTER FOR JOHANNESBURG, SOUTH AFRICA. — Tenders will be received by the Municipal Council of Johannesburg, South Africa, until Nov. 12 for one 750-kw. rotary converter.

AUTOMATIC SUBSTATION EQUIPMENT FOR MELBOURNE, AUSTRALIA. —Tenders will be received by the Melbourne and Metropolitan Tramway Board, Melbourne, Australia, until Nov. 26 for automatic substation equipment.

AUTOMATIC TELEPHONE EQUIPMENT FOR SYDNEY, AUSTRALIA.—Tenders will be received by the Postmaster-General's Department, Sydney, Australia, until Jan. 29, 1925, for automatic telephone equipment for the offices of the Ministry of Public Works.

New Incorporations

THE UPPER NEW YORK COUNTIES ELECTRIC CORPORATION, Gowanda, N. Y., has been incorporated by Kenneth T. Young, Winchester, Mass.; Harold R. Waldron, Gowanda, N. Y., and Donald W. Beebe, Arcade, N. Y. The capital stock consists of 2,000 shares of preferred stock ($100 par value) and 10,000 shares of common stock of no par value. Elton H. Beale, Marine Trust Building, Buffalo, is attorney.

THE INTERNATIONAL UTILITIES CORPORATION has filed articles of incorporation under the laws of Maryland. The company is capitalized at $110,000 and proposes to operate as a holding company for electric light and power and other utility properties. The incorporators are William H. Hall, M. H. Hammerling and Ralph P. Buell, 165 Broadway, New York City. Emory, Beeuwkes & Skeen, Equitable Building, Baltimore, are attorneys.

THE YORCO POWER COMPANY, INC., Norfolk, Va., has been chartered with a capital stock of from $10,000 to $25,000 to distribute heat, light and power. The directors are Henry B. Reardon, Jr., president; E. M. Estes, Jeffs, Va., secretary; E. P. White, Odd, and A. L. Eggleston, Norfolk.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

WILTON, ME. — The Wilton Woolen Company is planning to build a hydro-electric power plant for service at its mill, to cost about $35,000.

BOSTON, MASS. — The Edison Electric Illuminating Company has applied for permission to issue new capital stock (par value $7,785,700), part of the proceeds to be used for extensions and improvements.

LAWRENCE, MASS.—The installation of an ornamental lighting system on Essex Street is under consideration.

QUINCY, MASS.—The Edison Electric Illuminating Company is negotiating for a right-of-way through Quincy and Milton, for a proposed power conduit line from its new generating plant at Weymouth.

WINSTED, CONN.—Plans are being prepared by Strand & Sweet for the construction of a power plant. The equipment will include a generator and Diesel engine. A separate building for power plant will be erected in the spring. An electric hoist will also be installed.

Middle Atlantic States

ARCADE, N. Y. — The village officials have applied to the Public Service Commission for permission to extend the distribution line of the municipal electric light plant to the hamlets of Sandusky and Freedom to furnish electrical service.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 28, for 17,700 fuse elements for the South Brooklyn Navy Yard (Schedule 2765).

BUFFALO, N. Y.—The Barge Canal Dry Dock Company will install electric power equipment at its proposed local plant for drydock operation and other service. Four floating dock sections will be installed, each 44 x 65 ft., electrically operated.

CATSKILL, N. Y.—The Upper Hudson Electric & Railroad Company has been granted authority to extend its transmission lines in the towns of Greenville and Durham. It is proposed to extend the lines to East Durham in the town of Durham and to Freehold in the town of Greenville.

EDINBURG, N. Y.—The Brodalbin (N. Y.) Electric Light & Power Company has been granted permission to extend its electric lines into Edinburg to furnish service here.

FORT EDWARD, N. Y.—The Adirondack Power & Light Corporation has been granted permission to extend its transmission lines in Fort Edward and in the town of Verona.

ITHACA, N. Y.—The New York Central Electric Corporation has applied for permission to extend its transmission lines to supply electrical service in the towns of Bethel, Danby and Romulus, and for approval of franchises granted by the respective town boards.

KINGSTON, N. Y.—Authority has been granted to the Kingston Gas & Electric Company to extend its lines in the town of Kingston. It proposes to erect a distribution line north from the city of Kingston through the towns of Ulster, Kingston and Hurley.

MOUNT MORRIS, N. Y.—The Rochester Gas & Electric Corporation has engaged Chester W. Smith, Newburyport, Mass., engineer, to prepare plans for a power dam on the Genesee River in connection with a proposed hydro-electric development, to cost about $9,000,000.

NEWFIELD, N. Y.—Permission has been granted to the New York State Gas & Electric Corporation, Ithaca, to extend its transmission lines to furnish service in the town and village of Newfield.

NEW YORK, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education, Flatbush Avenue Extension and Concord Street, Brooklyn, until Oct. 21 as follows: Electric wiring and fittings, gas and electric fixtures for new Public School 136 on Edgecombe Avenue, between West 135th and West 136th Streets, borough of Manhattan; for electric wiring and lighting fixtures for addition to Public School 114, Remsen Avenue, Carnasie; electric wiring and fittings, gas and electric fixtures for addition to Public School 145, and work in connection therewith, at Central Avenue and Noll Street, Brooklyn; electric wiring and fittings, gas and electric fixtures for new Public School 32, Thirty-fifth Street, Auburndale, and electric wiring and fittings, gas and electric fittings for new Public School 122, Ditmas Avenue, Astoria, both Borough of Queens. William H. Gompert, Architect, is superintendent of school buildings.

POUGHKEEPSIE, N. Y. — The Public Service Commission has authorized the Central Hudson Gas & Electric Company to extend its transmission lines into the towns of Unionvale and Clinton and has given its approval of franchises granted by the Town Boards.

SPRINGVILLE, N. Y.—The Springville Sand & Gravel Company, it is reported, contemplates the purchase of a 100 or 150-hp. gas engine directly connected to generator, with auxiliary equipment.

PERTH AMBOY, N. J.—The Board of Aldermen is considering the installation of an improved street-lighting system in the Dublin section on Smith Street.

BELLWOOD, PA.—The Penn Central Light & Power Company has secured the local franchise of the Home Electric Power & Steam Heating Company, as well as similar light and power franchises at Warriors Mark and Birmingham, Pa. Extensions in transmission lines are contemplated.

ELLWOOD CITY, PA. — The Crescent Portland Cement Company, Wampum, it is reported, is planning to construct a power house at its proposed cement plant in this section. The cost of the project is estimated at $1,500,000.

HARRISBURG, PA.—The City Council contemplates extensions in the present lighting system in the business section. It is proposed to use single-lamp standards.

TYRONE, PA.—The Penn Central Light & Power Company, Altoona, which recently acquired the Home Electric Light & Steam Heating Company, plans to close down the local plant and will furnish electricity from a transmission line for local service.

CHURCH HILL, MD.—The citizens have authorized the Town Commissioners to erect a transmission line to connect with the municipal plant at Centreville to supply electricity to operate the local system. The cost is estimated at $5,000. The local generating plant will be closed down.

CRELLING, MD.—The Crandall Lumber Company contemplates the construction of a power house in connection with improvements to its local lumber mill, to cost about $50,000.

NORFOLK, VA.—The Pennsylvania Railroad Company, Philadelphia, is said to be planning to install electric power equipment at its proposed local refrigerator car re-icing plant, to cost about $100,000.

NORFOLK, VA.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 22 for electrical equipment for the local naval hospital, in connection with alterations and improvements (Specification 5033).

ROANOKE, VA.—The Board of Supervisors of Roanoke County has granted the Virginian Railway Company permission to erect a transmission line from Salem to Sears. The company, it is said, plans to build a line from Salem to Mullens, W. Va.

WASHINGTON, D. C.—Bids will be received by the chief signal officer, United States Army, until Oct. 28, for 1,200 storage batteries, lead type, and 300 rubber-sponge cushions for batteries (Proposal 18081-51); also, until Oct. 30, for 100 radio receivers, S. C. type BC-98-B (Circular C.P. 19005-1).

North Central States

CARO, MICH.—The Great Lakes Power Company, it is reported, contemplates extensions to its transmission line in Forester Township.

FLINT, MICH.—The Consumers Power Company has preliminary plans under way for the construction of a power plant on St. John Street. The work will be carried out in connection with transmission line and substation expansion in this section.

CLEVELAND, OHIO.—The installation of an ornamental lighting system on Superior Avenue, between the Public Square and East 105th Street, is under consideration by the Superior Avenue Association.

GUTHRIE, KY.—The Tennessee Electric Power Company, Chattanooga, has applied to the Public Utilities Commission for permission to purchase the transmission line of the Davidson Light & Power Company, Springfield, extending from Edenwold to Springfield. The company plans ultimately to extend its lines from Springfield to Guthrie.

LOUISVILLE, KY. — The Kentucky Hydro-Electric Company, M. E. Taylor Building, has petitioned the Federal Power Commission for a preliminary permit for power development from Locks No. 1 to 7 on the Kentucky River.

LOUISVILLE, KY.—Application has been made by the Louisville Hydro-Electric Company, care Byllesby Engineering & Management Corporation, Continental & Commercial Bank Building, Chicago, to the Federal Power Commission, for a preliminary permit for a 7,000-hp. hydro-electric development on Green River, near Mammoth Cave, including power house at dam and transmission line to Louisville.

ATTICA, IND.—The installation of an improved street-lighting system in the business district is under consideration by the City Council.

FORT WAYNE, IND.—The Indiana Service Corporation plans to build a mechanical building and machine shop on Spy Run Avenue, to cost about $150,000.

INDIANAPOLIS, IND.—Steps have been taken by the Irvington Commercial & Welfare Association to secure an improved lighting system on Washington Street between Emerson and Sheridan Avenues.

WAUKEGAN, ILL. — Plans are under consideration for replacing the mush-room safety lamps now in use with a new type of lamp.

SPARTA, WIS.—The Northern States Power Company will soon begin preliminary work for its proposed hydro-electric power development on Perch Lake, about 5 miles from the city.

WEST BEND, WIS.—Plans are being prepared for the installation of an ornamental lighting system in the downtown district. C. H. Shepard, 53 West Jackson Boulevard, Chicago, is engineer.

VIRGINIA, MINN.—Surveys are being made with a view of developing the water power resources of Virginia and vicinity in connection with the construction of a municipal electric plant. The Chamber of Commerce is interested in the project.

MASON CITY, IOWA.—Plans are being prepared by the United Light & Power Company for the construction of an office building and also a garage for twenty automobiles on Washington Street, to cost about $250,000.

BRAINERD, MINN. — The Council has approved plans for the construction of a transmission line and substation for municipal light and power service.

CORALVILLE, IOWA.—The Iowa City (Iowa) Light & Power Company plans to erect a 13,200-volt transmission line from Iowa City to Coralville, to cost about $85,000. Coralville has not a post office.

COUNCIL BLUFFS, IOWA.—The Citizens' Gas & Electric Company has applied for permission to extend its transmission line on the Hazel Dell Road, beyond the city limits.

ROCKWELL CITY, IOWA.—The Fort Dodge, Des Moines & Southern Railway Company is said to be planning to build a local substation.

SAC CITY, IOWA.—The Iowa Light, Heat & Power Company is planning to reconstruct its transmission line to Lake View, increasing the voltage to 33,000 volts. Connection will be made with a transmission line from Sioux City.

SOMERS, IOWA.—A bond issue is being arranged for the installation of a municipal electric lighting system.

BURLINGTON JUNCTION, MO. — The Maryville (Mo.) Light & Power Company is said to be planning the erection of transmission lines for commercial service in this section. Extensions to the transmission system are also contemplated.

EXCELSIOR SPRINGS, MO.—Extensions are reported to be under consideration by the North Missouri Power Company, including the erection of three transmission lines and two distribution systems in northwest Missouri. The first line is to extend from Ethel to Elmer, the second from Pattonsburg to Coffey, with a distribution system in Coffey; the third transmission line will be erected in Clinton County to supply electricity to Turney, and there will be also a distribution line from Shelbyville to Bethel.

GRAND FORKS, N. D.—The Red River Sugar Company, 416 Oak Grove Street, Minneapolis, it is reported, contemplates building a power plant at its proposed local sugar mill. The cost of the entire project is estimated at about $400,000.

IROQUOIS, S. D.—The local electric plant has been acquired by the Northwestern Public Service Company, Armour. The new owner plans to erect a high-tension line from its plant in Huron to furnish service here.

WEBSTER, S. D. — The Northwestern Public Service Corporation is said to be negotiating for the purchase of the municipal electric plant, which it proposes to remodel and extend for central-station service.

BEATRICE, NEB.—The City Council is planning extensions in the ornamental lighting system on a number of streets in the business section.

Southern States

CHERRYVILLE, N. C. — The Council contemplates extensions in the municipal electric system for which bonds have been issued.

ELIZABETH CITY, N. C.—The citizens have voted to acquire the light, water and sewerage plant.

MOORESBORO, N. C. — Bonds to the amount of $12,000 have been authorized for the installation of an electric light and power system. Electricity will be supplied by the Southern Power Company, Charlotte.

ESTILL, S. C.—The Estill Enterprise & Fertilizer Company contemplates rebuilding its electric lighting plant, recently destroyed by fire.

SPARTANBURG, S. C.—Work will soon begin on the survey for the proposed three-phase, 110,000-volt, steel-tower transmission line between Spartanburg and Columbia by the Southern Carolina Gas & Electric Company.

DUBLIN, GA.—The Southern Pulp & Naval Stores Company, 42 Broadway, New York, it is reported, plans to construct a power plant at its proposed local pulp mill, to cost about $500,000.

LEESBURG, FLA.—The City Council is considering the construction of a municipal electrically operated ice-manufacturing plant with initial output of 25 tons per day.

BRISTOL, TENN.—The Watauga Power Company contemplates extensions and betterments to its system.

MEMPHIS, TENN.—The Memphis Power & Light Company has disposed of an additional issue of $490,000 in capital stock, part of the fund to be used for extensions and improvements.

BERRY, ALA.—Surveys are being made by the Alabama Power Company, Birmingham, for a right-of-way for a transmission line which will extend from Coal Valley Pass, near Berry, and on to Fayette. A substation will be located in Berry, which will supply electricity here and in Fayette.

COLUMBUS, MISS. — The Mississippi Power & Light Company, Jackson, contemplates the construction of a steam-driven power plant in this vicinity, to cost about $2,500,000.

HAZLEHURST, MISS.—Plans are being considered for extensions and improvements to the municipal electric light and water-works systems.

MILAN, TENN.—The Municipal Electric Light and Water Department plans to install a 200-kva. generator and two boilers of 150 hp. capacity each during the coming year. Frank Thomson is superintendent.

ALEXANDRIA, LA.—Plans for the proposed pulp and paper mill to be erected in this vicinity by a new company now being organized include a power plant. The cost of the project is estimated at $1,000,000. The Alexandria Chamber of Commerce is interested.

DURANT, OKLA.—At an election to be held Oct. 21 the proposal to issue $53,500 in bonds for the extensions to the water-works system and the installation of an ornamental lighting system in the business district will be submitted to the voters.

WETUMKA, OKLA.—At an election to be held Oct. 28 the proposal to issue $150,000 in bonds, the proceeds to be used for new purification plant, pumps, oil-engine-driven generating plant, extensions to distribution system, etc., will be submitted to the voters.

CLINTON, TEX.—The Southern Pacific Company plans to install electric power equipment, including traveling cranes, etc., at its local wharves and terminal plant on the Houston ship channel, to cost about $1,000,000.

DENTON, TEX.—Plans are under consideration by the trustees of the College of Industrial Arts for the construction of a library, vocational, educational, dormitory and hospital buildings, and also refrigerating plant, to cost about $200,000. E. V. White is dean.

Pacific and Mountain States

SEATTLE, WASH.—The American Can Company, 120 Broadway, New York, plans to install electric power equipment in the proposed addition to its local plant, to cost about $1,000,000.

EUGENE, ORE.—Nearly all the right-of-way has been secured for the proposed high-tension transmission line from the municipal power plant on the McKenzie River, 2 miles west of Walterville, to the substation in Eugene.

MEDFORD, ORE. — The Owen Oregon Lumber Company contemplates the construction of a power plant at its proposed mills in this vicinity, cost about $1,000,000.

TOLEDO, ORE.—Plans are being considered for the installation of a substation and municipal electric distribution system, to cost about $100,000.

LOS ANGELES, CAL.—Bids will be received by the Public Service Commission until Oct. 24 for Diesel-engine generating sets (Specification 731).

LOS ANGELES, CAL.—The construction of a warehouse and shops, to cost about $500,000, is under consideration by the City Council. The engineering department of the Power Bureau, is in charge of the engineering work.

MODESTO, CAL.—The City Council has approved a resolution providing for the installation of an ornamental lighting system on a number of streets.

VENICE, CAL.—The Council is considering calling an election to vote on the proposal to issue $125,000 in bonds for fire and police alarm system, and also to issue $50,000 in bonds for street-lighting system.

Electrical Patents

Announced by U. S. Patent Office

(Issued September 2, 1924)

1,507,140. AUTOMATIC TELEPHONE SWITCH; J. N. Reynolds, Greenwich, Conn. App. filed July 21, 1921.

1,507,142. ELECTRIC HEATER; J. Schoenfeld, San Francisco, Cal. App. filed Aug. 1, 1922. Radiant or reflecting type.

1,507,144. TELEPHONE SYSTEM; F. F. Vallette, Berwyn, Ill. App. filed Dec. 1, 1922. Automatic.

1,507,160. PILOT-WIRE REGULATOR SYSTEM; G. Crisson, Hackensack, N. J. App. filed Dec. 30, 1922. Permitting the use of a grounded battery.

1,507,171. SOUND RECEIVER; W. Hahnemann and H. Hecht, Kitzeberg, near Kiel, Germany. App. filed July 21, 1921. For the reception and indication of submarine sound waves by an electromagnetic system.

1,507,178. METHOD OF AND MEANS FOR REDUCING INTERFERENCE IN TRANSMISSION SYSTEMS; H. W. Hitchcock, New York, N. Y. App. filed Sept. 6, 1921. By amplifying the useful energy before the interfering energy enters the path of transmission and combines with it.

1,507,190. HIGH-TENSION TRANSFORMER; H. Kress, Frankfort-on-the-Main, Germany. App. filed April 9, 1923. With a subdivided high-tension winding and with the exciting winding arranged between them on an open or closed iron core which is insulated from the earth.

1,507,204. BATTERY-CHARGING GENERATOR AND SAFETY CONTROLLER; A. H. Willougby and G. E. Roche, Portland, Ore. App. filed June 27, 1922. Automatic.

1,507,266. IGNITION SYSTEM FOR INTERNAL-COMBUSTION ENGINES; G. H. Whittingham, Baltimore, Md. App. filed June 4, 1923.

1,507,300. ELECTRICITY GENERATING AND STORAGE SYSTEM; J. B. Replogle, Detroit, Mich. App. filed March 31, 1920. Automatic, farm-lighting type.

1,507,306. IGNITION SYSTEM; W. A. Chryst, Dayton, Ohio. App. filed March 22, 1920. For internal-combustion engines with an electrically ignited fuel burner for heating the engine intake.

1,507,307. IGNITION SYSTEM; W. A. Chryst, Dayton, Ohio. App. filed Dec. 17, 1920. For internal-combustion engines equipped with an electrically ignited fuel burner, or for engines having a plurality of spark plugs in each cylinder.

1,507,309. IGNITION SYSTEM; J. T. Fitzsimmons, Dayton, Ohio. App. filed June 20, 1921. For an internal-combustion engine comprising a liquid fuel burner for heating the engine intake.

1,507,320. BATTERY TERMINAL PROTECTOR; W. A. Mackenzie, Long Beach, Cal. App. filed Sept. 7, 1923.

1,507,333. MAGNETIC TOY OR SIMILAR DEVICE; J. B. Carroll, Oak Park, Ill. App. filed Oct. 11, 1923.

1,507,334. LEVEL; J. N. Chadwick, Camden, N. J. App. filed Aug. 8, 1923. Using a small lamp to illuminate indicator.

1,507,346. METALLURGICAL PROCESS; R. A. Driscoll, Bay Point, Cal. App. filed Feb. 9, 1921. Of producing pig iron and like products within an electric furnace which utilizes iron and steel turnings and other small scrap metal.

1,507,347. ELECTRIC BRUSH HOLDER; D. B. Flower, Glenside, Pa. App. filed March 11, 1924. Box type.

1,507,348. ELECTRIC GENERATOR; H. Ford, Dearborn, Mich. App. filed Nov. 5, 1920. Double-current output type to supply selectively or simultaneously both direct and alternating current.

1,507,365. ARC-GAP INSTALLATION; C. E. Bennett, Decatur, Ga. App. filed April 7, 1922. Gap terminal.

1,507,391. SAFETY AND SHORT-CIRCUITING DEVICE FOR SPARK PLUGS; C. K. Malott, Indianapolis, Ind. App. filed June 12, 1920.

1,507,395. PROTECTING CONDENSER PARTS AGAINST CORROSION; R. D. Mershon, New York, N. Y. App. filed Sept. 14, 1920. Electrolytic condensers.

1,507,425. ELECTRIC WELDING MACHINE; W. E. Reed, Pittsburgh, Pa. App. filed May 29, 1922. For welding crossed wires or rods, as in the manufacture of welded metal fabrics for fencing and concrete reinforcement.

1,507,504. DIRECTION CONTROL MECHANISM FOR AEROPLANES; W. M. Morgan, Kansas City, Mo. App. filed March 22, 1921.

1,507,509. PROCESS FOR MANUFACTURING CARBON FILAMENT FOR INCANDESCENT LAMP; K. Nishikawa, Tokyo, Japan. App. filed July 21, 1921.

1,507,544. ELECTRIC FLUID HEATER; L. B. Cheatham, Atlanta, Ga. App. filed March 22, 1924. Resistance element in direct contact with the fluid.

(Issued September 9, 1924)

15,911 (reissue) SANITARY MOUTHPIECE; N. Gelb, Newark, N. J. App. filed March 15, 1922.

1,507,566. COMMUTATOR BRUSH AND METHOD OF MAKING IT; V. G. Apple, Dayton, Ohio. App. filed Sept. 27, 1920.

1,507,587. PROTECTIVE DEVICE FOR ELECTRICALLY HEATED UTENSILS; G. E. Curtiss, New Britain, Conn. App. filed Dec. 1, 1922.

1,507,606. ROTARY ELECTRIC MACHINE; K. v. Kando, Budapest, Hungary. App. filed Sept. 17, 1920. High-voltage; using oil insulation for stator.

1,507,609. ELECTRICAL CONNECTER; S. D. Kretzer, St. Louis, Mo. App. filed Sept. 22, 1921. For tapping a main cable.

1,507,612. CURRENT COLLECTOR; E. S. Lincoln, Mansfield, Ohio, App. filed Sept. 14, 1921. For trackless trolley system.

1,507,616. ELECTROTYPER'S CASE; W. W. McCarroll, New Haven, Conn. App. filed Jan. 5, 1924.

1,507,648. TRAIN SIGNAL SYSTEM; D. H. Wilson, Wortendyke, N. J. App. filed Sept. 2, 1920. Using the air hose of the air-brake system to act as connectors and carriers for the electrical conductors.

1,507,653. COMPASS RELAY TRANSMITTER; M. L. Zobel, Rosebank, N. Y. App. filed Oct. 20, 1919. For effecting the repetition of movements of an instrument such as a master or gyroscopic compass.

1,507,668. TELEPHONE INSTALLATION; E. A. Driscoll, New York, N. Y. App. filed June 15, 1921. Of the desk and wall type.

1,507,684. AUTOMATIC TELEPHONE SYSTEM; R. G. Richardson, Chicago, Ill. App. filed Aug. 1, 1921.

1,507,716. ELECTRIC HAIR CLIPPER; W. H. Redman, East Orange, N. J. App. filed Dec. 31, 1920.

1,507,725. DOUBLY TUNED WIRELESS RECEIVER; J. Bethenod and M. Latour, Paris, France. App. filed Aug. 19, 1921. To decrease the influence of disturbing currents.

1,507,727. X-RAY CASSETTE; A. W. Buck, St. Louis, Mo. App. filed May 31, 1922.

1,507,728. SIGNAL DEVICE; J. A. Burgard, Oakland, Cal. App. filed Jan. 18, 1921. For signaling in darkness or semi-darkness as when used by an usher in a theatre.

1,507,741. STARTER-MOTOR CONTROLLING MEANS; A. T. Kirk, W. T. Kirk and O. E. Barber, Chicago, Ill. App. filed Feb. 3, 1922. For an automobile.

1,507,763. TELEPHONE TRANSMISSION SYSTEM; D. F. Whiting, New York, N. Y. App. filed Jan. 10, 1920. Will efficiently transmit current of different frequencies.

1,507,764. ROOFING MACHINE; M. L. Beeson, San Diego, Cal. App. filed March 23, 1922. For laying gravel and paper composition roofing.

1,507,768. PORTABLE ELECTRIC LIGHT; C. B. Collins, Franklin, Pa. App. filed July 30, 1923. Using a spring motor to generate current.

1,507,777. MAGNETIC CHUCK; S. Karasick, New York, N. Y. App. filed April 9, 1929.

1,507,788. ELECTRIC WELDING TOOL; L. A. McCarty, Jackson, Ohio. App. filed April 14, 1924. For holding the electrode wires.

1,507,807. ELECTRICALLY HEATED TROWEL; M. L. Beeson, Los Angeles, Cal. App. filed March 19, 1923. Finishing mastic flooring.

1,507,808. FIXTURE CHAIN; R. B. Benjamin, Chicago, Ill. App. filed June 5, 1919.

1,507,809. DRY BATTERY; H. F. French and R. C. Benner, Fremont, Ohio. App. filed Aug. 9, 1920. Deferred-action type.

1,507,825. HOMOPOLAR ELECTRIC CURRENT GENERATOR OR MOTOR; J. F. Gill and J. N. Chaviara, Liverpool, England. App. filed Nov. 28, 1923. Using mercury to connect the current conductors of the rotor to the current conductors of the stator.

1,507,883. UNIVERSAL COOKING MACHINE; H. A. Campbell, Oakland, Cal. App. filed April 9, 1923.

1,507,884. GASEOUS TELEPHONE TRANSMITTER; R. A. Engler, Evanston, Ill. App. filed Sept. 2, 1919.

1,507,887. WAVE TRANSFERRING CIRCUITS FOR COMMUTATION SYSTEMS; J. Mills, Wyoming, N. J. App. filed June 1, 1916. To secure simultaneous sending and receiving without the use of several antennas.

1,507,889. METHOD AND MEANS FOR REPEATING; A. M. Nicolson, New York, N. Y. App. filed March 18, 1918. By amplification of received signals.

1,507,894. SIGNALING SYSTEM; C. A. Robinson, Washington, D. C. App. filed Dec. 17, 1921. In which it is desired to transmit currents of different frequencies at different times.

1,507,895. RHEOSTAT; F. A. Rojas, New York, N. Y. App. filed June 10, 1922. Compressible resistance type.

1,507,898. FLEXIBLE CONNECTING DEVICE FOR ELECTRICAL CIRCUITS; V. E. Summers, Pittsburgh, Pa. App. filed Sept. 3, 1921.

1,507,901. ELECTRIC HEATER; L. S. Wells, New York, N. Y. App. filed March 22, 1922. For switches of railway tracks.

1,507,905. SIGNALLING SYSTEM; W. E. Beatty, Bayside, N. Y. App. filed Nov. 6, 1917. In which modulated high-frequency carrier currents are employed.

1,507,913. MODULATION OF ELECTRICAL WAVES; A. L. Fitch, Rutherford, N. J. App. filed Aug. 29, 1919. In systems where rectifying or unsymmetrically conducting devices are used for the production of modulated high-frequency waves.

1,507,936. STORAGE-BATTERY TERMINAL; F. G. Schmitt, Leetsdale, Pa. App. filed March 26, 1920. Non-corrosive.

1,507,946. SWITCH CONTROL CIRCUITS; J. J. Wynne, Roselle Park, N. J. App. filed April 8, 1922. For automatic telephone systems.

1,507,966. TELEPONE SYSTEM; F. S. Irvine, Long Island, N. Y. App. filed Sept. 11, 1920. Machine switching.

1,507,994. ELECTRIC CIRCUITS; F. E. Field, Somerville, N. J. App. filed Nov. 1, 1921. For reducing the distortion in a repeating system using vacuum-tube repeaters.

1,508,035. FUSIBLE SWITCH; W. B. Underwood, Rochester, N. Y. App. filed Aug. 9, 1922. For heated containers.

1,508,088. ELECTRICITY METER; S. Z. de Ferranti and G. Wall, Hollinwood, England. App. filed Jan. 21, 1921. With adjusting device.

1,508,096. ELECTRIC MOTOR-GENERATOR; W. R. Garner, Erie, Pa. App. filed Nov. 26, 1919. Having improved bearing means and parts counterbalanced.

1,508,100. INDUCTION MOTOR AND THE LIKE; J. B. Hawley, Jr., Colorado Springs, Col. App. filed March 14, 1923. With sectionalized rotor, part of which is allowed to slip so as to develop a higher torque.

1,508,108. SOLDERING OR WELDING TOOL; L. Lombardi, Rome, Italy. App. filed April 21, 1923. Using an electric arc and a magnetic field for directing it.

1,508,112. MOTION-SIGNAL AND REAR-VIEW LIGHT FOR MOTOR VEHICLES; L. Michaelson, Dollar Bay, Mich. App. filed Oct. 11, 1923.

1,508,131. MOTOR CONTROLLER; E. W. Seeger, Milwaukee, Wis. App. filed Oct. 11, 1922. For printing presses.

1,508,151. WIRELSS SIGNALING SYSTEM; E. F. W. Alexanderson, Schenectady, N. Y. App. filed April 19, 1916. To overcome the effect of static disturbances in the receiving instruments.

1,508,152. SQUIRREL-CAGE WINDING FOR ALTERNATING-CURRENT MOTORS; P. L. Alger, Schenectady, N. Y. App. filed May 4, 1922. With one or more squirrel-cage windings on the rotor elements.

1,508,156. MEANS FOR INDICATING SLIPPAGE OF WHEELS; E. F. Bliss, Schenectady, N. Y. App. filed Aug. 20, 1919. Of an electric locomotive.

1,508,158. COUPLING FOR INSULATORS; G. W. Bower, Schenectady, N. Y. App. filed Sept. 16, 1921. Suspension high-tension insulators of the link type.

1,508,159. INSULATOR; J. M. Brown, Pittsburgh, Pa. App. filed Dec. 14, 1918. For supporting busbars.

1,508,162. MEANS FOR PRODUCING HIGH VOLTAGE; L. W. Chubb, Pittsburgh, Pa. App. filed May 16, 1919. Unidirectional voltage adapted for use in precipitating apparatus.

1,508,164. ELECTRIC FURNACE; E. F. Collins, Schenectady, N. Y. App. filed May 18, 1921. Packing for electrode where it passes through the furnace wall.

1,508,167. MOUNTING FOR TUNING RADIO CIRCUITS; J. W. Cushing, Ionia, Mich. App. filed March 27, 1923.

1,508,174. CONTROL OF ELECTRIC SWITCHES; A. S. Fitzgerald, Finchley, England. App. filed Aug. 28, 1923. To render less sensitive the protective device during the switching in or out of the circuit or at any other desired time.

1,508,184. LIGHTING FIXTURE; W. Harrison, Cleveland, Ohio. App. filed Jan. 8, 1921.

1,508,199. IMMERSION WATER HEATER; F. Thornton, Jr., Mansfield, Ohio. App. filed Sept. 23, 1921.

1,508,205. CLOCK MOTOR; H. E. Warren, Ashland, Mass. App. filed Oct. 27, 1922. For secondary clocks.

1,508,228. SYSTEM OF COOLING DYNAMO-ELECTRIC MACHINES; T. P. Kirkpatrick, Wilkinsburg, Pa. App. filed May 17, 1920. Operating in a vacuum, as a motor for actuating a ship's gyroscope.